ENGINEERING NEWS-RECORD

JULY 17, 1941

Naval Airbase at Corpus Christi
Connecticut River Flood Control
Use of Models for City Planning
Highway Across Isthmus of Panama

Outer defense wall of Hartford against Connecticut River flood attacks

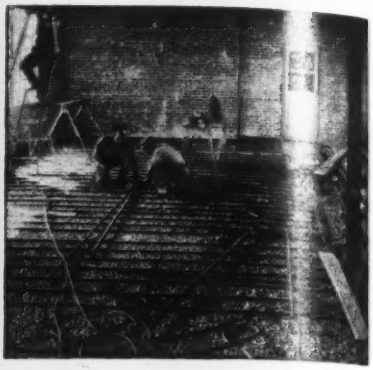
How

GREENVILLE STEEL & FOUNDRY CO.

installed and Protected

ITS RADIANT HEATING INSTALLATION

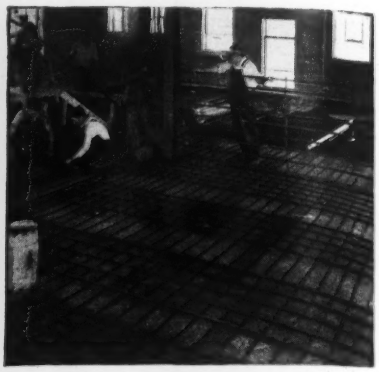
On the first floor, a broken stone fill was laid on the ground, and carefully smoothed as a bed for the coils.



Byers Wrought Iron ¾" and 1" pipe, fabricated by welding, into coils in the company's shops, was laid on the foundation.

Pipe coils were carefully pitched for drainage, and additional broken stone was placed around and above them.

A 2" concrete slab was poured on the broken stone base to form the finished floor, completing this installation.



On the second floor, grids were laid over cork insulation and topped with a concrete slab to form the finished floor.

BYERS WROUGHT IRON

Radiant Heating has been such a lively topic of discussion among engineers everywhere that this representative job may be of interest to you. It was selected from the many available because the progress pictures plainly show the ease and simplicity of installation.

The two-story building, which houses the administrative offices of the Greenville Steel and Foundry Company, Greenville, S.C. is 40' x 50' and is completely heated with radiant heating. Hot water is circulated through the coils by a ¼" HP motor, controlled by an indoor-outdoor thermostat. The cost of installation was reported as considerably below that of conventional types. After a winter's experience, the general manager wrote, "All of us believe that this is the most comfortable building we have ever worked in. We are sold on it." Figures on cost of operation are not yet available, but experience indicates that a substantial saving may be expected.

Corrosion costs you more than Wrought Iron

Continued satisfaction from this installation is assured by the exclusive use of Byers Wrought Iron pipe for all coils. Experience in many similar installations has demonstrated that Byers Wrought Iron combines to an unusual degree the highly important factors of corrosion resistance, desirable thermal properties, and ease of fabrication, that vitally affect the cost, the operation, and the life of a radiant heating system.

If you are considering a Radiant Heating installation—or in fact any new or repair work on piping services where corrosion may be encountered—we suggest that you give careful thought to the advantages of using wrought iron as demonstrated by the experience of present users.

Our Radiant Heating Bulletin gives a complete story of this interesting new development. Our General Catalog lists all Byers Wrought Iron products . . . pipe, plate, bars and shapes. Either the Bulletin, the Catalog, or both, will be sent you on request.

A. M. Byers Co., Pittsburgh, Pa. Established 1864. Boston, New York, Philadelphia, Washington, Chicago, St. Louis, Houston, Seattle, San Francisco.

BYERS GENUINE WROUGHT IRON

TUBULAR AND FLAT ROLLED PRODUCTS

STEEL TUBULAR PRODUCTS

ENGINEERING NEWS-RECORD

Devoted to Buildings, Sewers, Waterworks, Bridges, Highways, Streets, Dams, Foundations, Earthwork, Flood Control, Public Works, Irrigation, Canals, Railroads

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Vol. 127 JULY 17, 1941 No. 3

THIS WEEK

• Building a $28,000,000 naval airbase within a time limit of 12 months offered many unusual problems. Practically every type of heavy construction was involved. How the contractor carried out the job and successfully met the deadline is described in this issue.

• Waterworks preparedness for defense—operations, maintenance and management—was the theme of the American Water Works Association meeting last month at Toronto. Highlights of all important discussions will be found on pages 63–66.

• Beginning in this issue is the first of several articles to appear on the Connecticut River flood control development. This article outlines current plans, methods of selecting reservoir sites, and economic aspects of constructing reservoir and protective works in relation to benefits afforded.

• An improved method, which offers greater accuracy at less cost for labor and explosives, for determining subsoil conditions on foundation explorations by the offset shooting method is described in this issue. Formulas and equations are given to explain the method.

THINGS TO COME

• The Ford Motor Co.'s airplane engine plant at River Rouge sets a new precedent in industrial plant design. It is in reality—a building within a building—which offers the ultimate in operating efficiency. The building's unique design and construction features will be described in the July 31 issue.

• In many respects welded bridge practice in Europe is far in advance of our own. Bridge designers and fabricators will be interested in a forthcoming article on recent developments—techniques and experiences—illustrated with examples of all-welded bridges built just prior to the outbreak of war.

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Number of copies of this issue printed: 35,348

ACCENT ON TIME!

How Atlas High-Early Cement speeds up jobs for National Defense, Public Work, and Private Construction

7 DAYS' TIME SAVED ON EACH FLOOR WITH ATLAS HIGH-EARLY CONCRETE!
Public Service Electric & Gas Co., East Orange, N. J. *Engineer:* W. J. Harvey, Gas Dept.; *Contractor:* Becker Construction Co., Newark, N. J.; *Sub-contractor:* Geo. Peterson, Inc., Harrison, N. J.

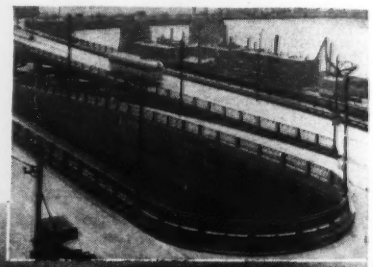
READY FOR 560 TONS OF STEEL IN 70 HOURS!
Tennessee Coal, Iron and R. R. Co., Wenonah Mines, Ala.; *Engineer:* A. W. Beck, T. C. I. & R. R. Co.; *Contractor:* Rust Engineering Co., Pittsburgh.

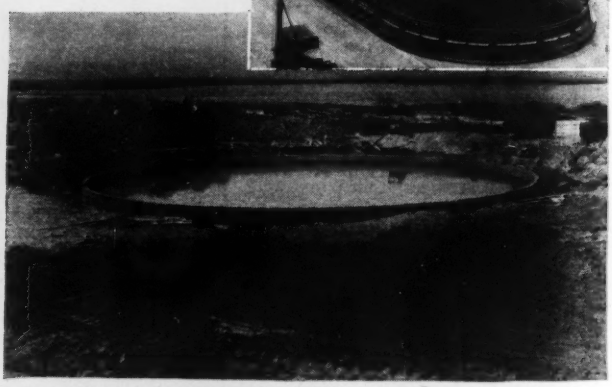
SEND for interesting folder, "Case Histories of Days and Dollars," which shows how Atlas High-Early cement can save time and money for you on many jobs. Universal Atlas Cement Co. (United States Steel Corp., Subsidiary), Chrysler Bldg., N.Y.C.

OFFICES: *New York, Chicago, Philadelphia, Boston, Albany, Pittsburgh, Cleveland, Minneapolis, Duluth, St. Louis, Kansas City, Des Moines, Birmingham, Waco.*

DEFENSE WORK PUSHED AHEAD 13 DAYS!
Monarch Machine Tool Co., Sidney, Ohio; *Contractor:* M. C. Ferguson, Sidney, Ohio; *Architect:* Schenk & Williams, Dayton, Ohio.

OPENED TO TRAFFIC 20 DAYS SOONER!
Water Street, Pittsburgh; *Sub-contractor:* Harrison Construction Co., Pittsburgh.





12 DAYS SAVED ON FOUNDATIONS!
Rayonier, Inc., Fernandina, Fla.; *Engineer:* Central Engineering Co., Port Angeles, Washington; *Contractor:* Rust Engineering Co., Pittsburgh.

NR-N-32

ATLAS HIGH-EARLY CEMENT

A UNIVERSAL ATLAS PRODUCT

The Week In Engineering and Construction

ENGINEERING NEWS-RECORD • JULY 17, 1941

New defense construction would total $384,000,000

Included in President's request for eight billion dollars more, funds would be spent for Army, Navy, and Maritime Commission facilities

With Congressional action barely complete on record defense appropriations for the coming fiscal year, the President last week asked Congress for another eight billion dollars of defense money—for the Army, Navy and Maritime Commission. Included in this sum was $384,000,000 directly for construction. In addition, large sums for construction are included in the expansion of shipyards and manufacturing plants to expedite the Navy building program, for which $585,000,000 is asked, and expansion of submarines and cargo ships, for which $50,000,000 is asked.

Biggest of the construction estimates is $300,000,000 for the Bureau of Yards and Docks program to expand the Navy's shore base facilities. About $100,000,000 of this is for work at Navy air stations, including work at three of the new Atlantic bases acquired from Britain: $3,000,000 at Bermuda; $13,017,000 at New Foundland; and $15,045,000 at Trinidad. Other large air station projects are at Barber's Point, Hawaii, $18,605,000; Caviteti, P. I., $5,510,000; and Corpus Christi, Tex., $8,522,000.

A $46,000,000 program of storage facilities is included in the Navy work. Biggest projects are a $16,000,000 fuel depot and $6,850,000 supply depot at Pearl Harbor, and a $7,300,000 supply depot at Bayonne, N. J. A further $24,000,000 is to be spent for ammunition storage, including a $10,000,000 depot at Burns City, Ind. and a $4,349,000 depot at Hawthorne, Nev. Work at the Virgin Islands, Canal Zone, Alaska and Pacific bases will cost about $19,000,000 and widely scattered Navy hospital facilities will total $8,630,000.

The Navy program of factories, shipways, and other facilities includes $160,000,000 for ship repair facilities. This will involve construction of drydocks, piers, cranes, and shop buildings as well as the acquisition of machinery. About $70,000,000 is to be spent in Navy yards and about $90,000,000 in private yards.

The Navy also plans to expend $300,000,000 in providing additional facilities for construction of Navy vessels. Some $500,000,000 has already been spent for this purpose. Of this new money $60,000,000 will be spent on ways and other shipyard requirements, while the rest will go for expansion of plants making equipment. The largest part—$114,000,000—will be for steel making and fabricating capacity to produce armor plate.

Finally, the Navy will spend $120,000,000 on expanding facilities for the manufacturing of ordnance. This includes construction of a $70,000,000 plant for the manufacture of a new secret explosive.

The other direct construction request is for $84,000,000 for construction at military posts for the Army Quartermaster Corps. This represents expansion and manufacture of facilities at existing cantonments rather than any major new program.

No breakdown is yet available on the $50,000,000 which the Maritime Commission proposes to spend for cargo ship construction facilities.

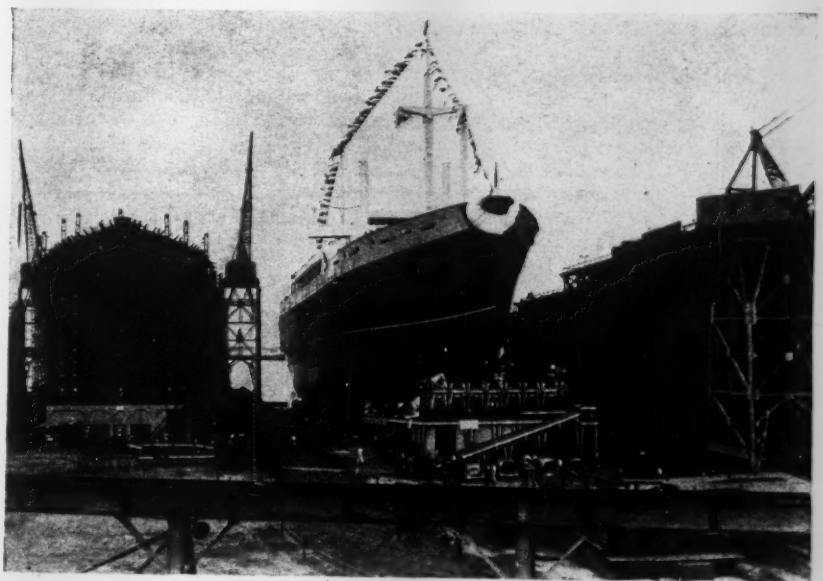


Photo by J. Monteil

New shipyard turns out first welded passenger ship

Shipbuilding history was made two weeks ago when the world's first all-welded passenger vessel, the African Comet, was launched from the new yards of the Ingalls Shipbuilding Corp. at Pascagoula, Miss. The event belongs to construction history too, for the shipyard in which it was built is a part of our "building for defense" effort. The ten American shipyards with 46 ways capable of taking 400-ft. ships that were in existence in 1936 will soon be swelled to 29 with 186 ways. And even the ships themselves are taking structural designers and skilled workmen from construction's rolls.

The African Comet is the first of three all-welded ships being built in the Ingalls yard. She is 489 ft. long and has a displacement of 18,500 tons. From keel laying to launching, her time on the ways was 358 days, according to the Ingalls firm.

Government puts an end to "Am. Soc. of Engineers"

The Post Office Department on June 9 issued to the postmaster at Berwyn, Ill., a fraud order stopping all payments of money orders and the delivery of all mail to the "American Society of Engineers; Fred Gross, President." The order states: "that American Society of Engineers; Fred Gross, President, and their officers and agents as such, at Berwyn, Ill., are engaged in conducting a scheme or device for obtaining money through the mails by means of false and fraudulent pretenses, representations and promises in violation of sections 259 and 732 of title 39 United States Code."

Accompanying the fraud order was a memorandum of evidence collected by postal inspectors to show that the so-called society never had any meetings and never functioned as a technical society but that this perpetual president, Fred Gross, filed with the secretary of state of Illinois the annual reports needed to keep its charter alive. The society was incorporated in 1923 and had existed for eleven years previous to that time as a "voluntary association." The inspector found that "the office of the alleged National Society of the entire engineering profession, to which he was escorted by Gross, was behind a large oil furnace in the basement of a building at 3134 Oak Park Ave. . . . At this interview, Gross admitted that the society had not been active in the past ten years, that it had no employees, and that he was the president and treasurer solely because the board of directors had never provided for annual meetings."

The evidence also showed that there had been no annual meetings for the purpose of holding elections. Gross informed the inspector that at the time of the interview he had 166 paying members, but that at one time he had had as many as 10,000 members, 800 of whom were paying members. The report notes, however, that in Gross' filed answer to the fraud charges the greatest number of paying members was 274 in 1925 and the smallest number was 36 in 1936. The society had no membership roll.

That the so-called American Society of Engineers was a fraud has long been known because of its regular appeals to nonsuspecting engineers to join, but heretofore attempts to obtain the evidence needed by the Post Office Department have been fruitless. Periodically this journal and the several engineering societies have reported that the society served no useful purpose, but its appeals for members continued to go out and, apparently, were sufficiently successful to keep the racket alive.

• • •

New airports approved since January 1 total 75

Brig. Gen. Donald H. Connolly, Civil Aeronautics Administrator, reports that 75 new airports have been approved for the nation's system of defense and civil landing fields since Jan. 1, as compared with only 51 added during the entire year 1940. This brings the total number of airports approved by the CAA throughout the nation to 2,277. In addition more than 100 other airports throughout the country have been improved through the $40,000,000 program instituted last December.

Airports in Classes 2, 3 and 4, which are of greater size and with more adequate facilities, have increased in number while Class 1 airports, the lowest category, has been decreased by 166. Many other airports will be added and improved before the end of the year through the aid of a congressional appropriation to the CAA of more than $94,000,000, which became effective July 1 for building and improvement work, General Connolly reports.

Present approved ports include 1,035 municipal, 795 commercial, and 282 intermediate; 27 Navy and 74 Army, 41 miscellaneous government fields, and 23 private landing fields. Of the total, 690 are either fully or partially equipped for night landings.

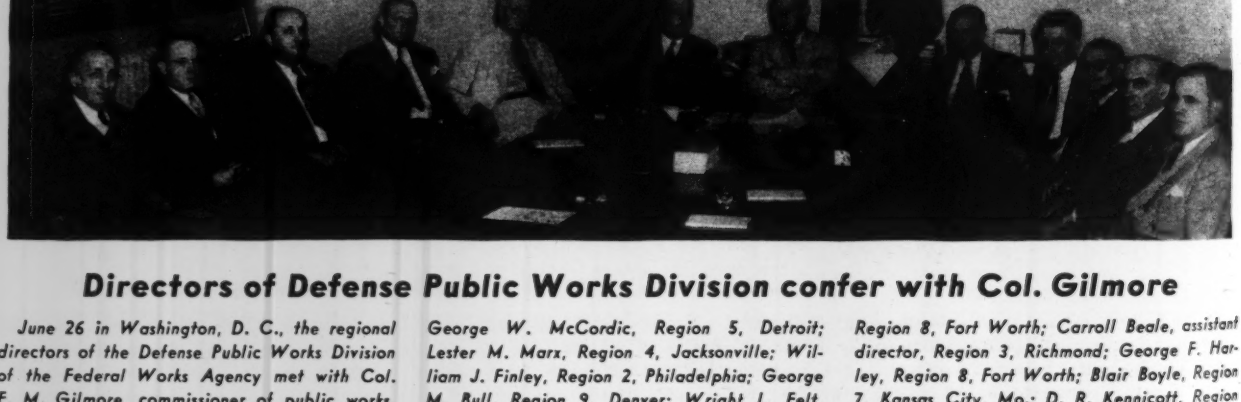
New seaplane bases made available since Jan. 1 total 36.

• • •

Second opening obtains no bids for Ohio job

For the second time within a few weeks the Ohio State Highway Department at a letting July 8 failed to receive bids for the relocation of 5.6 mi. of State Route 5, the major military access road from the east to the new federal munitions plant near Ravenna. As a result, bids will be opened at a letting scheduled for early in August, according to Highway Director Hal G. Sours.

Director Sours offered two possible reasons for the unwillingness of contractors to bid on the job, which is estimated to cost $655,000. One is the shortage of labor and the high wage scales due to extensive construction in Portage County where the project is located, and the other is the uncertainty as to priorities on steel necessary for a bridge and two railroad underpasses.



Directors of Defense Public Works Division confer with Col. Gilmore

June 26 in Washington, D. C., the regional directors of the Defense Public Works Division of the Federal Works Agency met with Col. E. M. Gilmore, commissioner of public works. Among those present were left to right: James A. McConnell, Region 1, Boston; George W. McCordic, Region 5, Detroit; Lester M. Marx, Region 4, Jacksonville; William J. Finley, Region 2, Philadelphia; George M. Bull, Region 9, Denver; Wright L. Felt, Region 10, Los Angeles; Col. E. M. Gilmore (standing); Uel Stephens, assistant director, Region 8, Fort Worth; Carroll Beale, assistant director, Region 3, Richmond; George F. Harley, Region 8, Fort Worth; Blair Boyle, Region 7, Kansas City, Mo.; D. R. Kennicott, Region 6, Chicago; and Lindley R. Durkee, Region 11, Seattle.

Baltimore will sell sewage effluent for industrial water supply uses

Bethlehem Steel Co. signs contract with city to purchase 40 mgd. of treated sewage because groundwater sources are proving inadequate to meet expanding processing needs.

Treated sewage effluent from the Baltimore disposal works is to serve as part of the industrial water supply for the Bethlehem Steel Co. plant at Sparrows Point, Md. An agreement between the city and the steel company was signed on July 9 whereby the company contracted to purchase up to 40 mgd. of treated sewage for use in steel processing operations. The Baltimore disposal works handles about 90 mgd. of sewage, the effluent being discharged to waste in Back River. The sale of 40 mgd. will net the city about $24,000 annually.

Faced with a serious depletion of groundwater resources in the Sparrows Point area, the Bethlehem Steel Co. has been seeking a new source of fresh water since 1940. Vast amounts of water are needed for almost all steel-making processes, and with recent plant expansion the demands have been accentuated. Static levels in all of the company's wells have fallen, in some instances as much as 100 ft. And furthermore the water has become contaminated with salt water intrusions.

Abel Wolman, professor of sanitary engineering at the Johns Hopkins University, was called in for consultation and he suggested the use of sewage effluent from the Baltimore disposal works four miles away. Tests revealed that by further treatment (using chemical precipitation methods) the effluent could be converted into a suitable industrial water supply. As a result, the Bethlehem Steel Co. made an agreement with the city and will spend about $2,000,000 in constructing a 48-in. pipeline and treatment plant.

Concerning the characteristics of the effluent which the city will produce, the agreement states that: (1) hydrogen ion concentration shall not exceed a pH of 7.8 or fall below 6.5; (2) total suspended solids shall not exceed an instantaneous maximum of 50 ppm. and the monthly average shall not exceed 25 ppm.; (3) five-day biochemical oxygen demand shall not exceed an instantaneous maximum of 45 ppm. and the monthly average shall not exceed 25 ppm.; (4) chloride content shall not exceed 170 ppm.

The above refer to effluent produced from the activated sludge sewage treatment process, which is used to treat about half the volume of Baltimore's sewage. Trickling filters are used to treat the balance, and if it becomes necessary to use this effluent, the city will not have to meet all the requirements listed above. (See *ENR*, Jan. 5, 1939, p. 33 for details of Baltimore's treatment plant facilities).

Payment for the effluent is arranged on a sliding scale, depending on the volume used. For less than a 25-mgd. average the rate is $1,000 a month; for 25 to 37.5 mgd. the company will pay $1,500 a month, and for an average of more than 37.5 mgd. the rate is $2,000.

Acting for the Bethlehem Steel Co. in these negotiations were S. J. Cort, general manager of the Sparrows Point plant, L. M. Coffin, chief mechanical engineer, and Abel Wolman, consulting engineer. The Baltimore negotiators were George Cobb, chief engineer, department of public works, and George Finck, chief of the bureau of sewers.

Detailed designs and construction work on the pipeline and treatment plant to be built by the Bethlehem Steel Co. will be handled by Whitman, Requardt & Smith, consulting engineers of Baltimore.

• • •

West Virginia to hold sanitation position tests

Announcement is shortly to be made of unassembled examinations to be given for the following West Virginia state health department positions: sanitary engineering director, $350-400; engineer, $310-350; associate engineer, $270-310; assistant engineer, $220-270; associate engineer, $250-310; chemical engineer, $220-270; principal sanitarian, $220-270; senior sanitarian, $175-220; and senior chemist, $175-220.

Residence in West Virginia has been waived. Additional information may be obtained by writing Carl M. Frasure, Merit System Council, Morgantown.

D. W. Mead honor guest at hydrology conference

When 230 engineers representing 31 states, the Canal Zone and the District of Columbia gathered at Pennsylvania State College June 30 for a three-day hydrology conference, Daniel W. Mead (left above) was guest of honor. Mr. Mead, professor emeritus of hydraulic and sanitary engineering at the University of Wisconsin and past president of the American Society of Civil Engineers, is shown receiving from Prof. F. T. Mavis, chairman of the conference and head of the civil engineering department at Penn State, a scroll in recognition of his distinguished work in the field of hydrology and hydraulic engineering, which includes "Notes on Hydrology" published in 1904 and reported as the first American publication on that subject.

The conference was held under the joint auspices of the section of hydrology of the American Geophysical Union, the civil engineering division of the Society for the Promotion of Engineering Education, the American Society of Civil Engineers committee on hydrology, and Penn State College. Five major symposia outlined the fields studied under the headings: the scope of applied hydrology; rainfall and runoff; delays in the hydrologic cycle; losses in the hydrologic cycle; and flood problems.

PRIORITIES GUIDEPOST

Current notes on what, who and how

DETAILED MACHINERY by which highway departments and several other public services may obtain priority ratings on materials and equipment needed for repair and maintenance of highways will be set up within a few days. Leon Henderson's Office of Price Administration and Civilian Supply recently recommended that maintenance requirements in 26 fields should be given preferential status, and the Priorities Division of OPM is now working out the way to do it. Included in the 26, in addition to highways are: railways, street railways, pipelines, electric and gas utilities, water and sewer service, public buildings and parks, mining and quarrying.

A rating of A-10, which is high enough to get reasonably prompt deliveries on most things, would be applied to orders for maintenance materials, while orders to cover emergency repairs essential to continuation of service will probably get an A-1-a rating.

Just how this will work is not yet definitely decided. Probably agencies wishing ratings will be required to apply to OPM in Washington. They will receive a blanket rating covering their maintenance and repair purchases of items on the priorities critical list (*ENR*, July 10, 1941, p. 2). The agency will then merely send copies of the rating to its regular suppliers.

Mammoth New York Building nears completion

New York's $19,300,000 Criminal Court Building and City Prison, which have a common basement, and are joined above street level by two bridges, were dedicated June 30. The cornerstone of the combined structure was laid June 28, 1940, thus in one year, what is considered the largest municipal building known, has been completed in record time. This achievement, however, does not include excavation and foundation work.

An idea of the size of the structure, which covers two full city blocks, may be gained by noting that there are more than a million sq.ft. of cement-finished floors and sidewalks in this structure, plus 200,000 sq.ft. of terrazo floors, 150,000 sq.ft. of tile floors and walls, 154,000 sq.ft. of interior marble wainscoting and partitions and 110,000 sq.ft. of glass block. Structural steel used amounted to 17,500 tons.

The huge structure is located in downtown New York and was built by the New York Department of Public Works. Cauldwell-Wingate Co. was the general contractor and the architectural work was done by Harvey, Wiley & Corbett and Charles B. Meyers. Spencer White & Prentiss was the foundation contractor and Bethlehem Steel Co. supplied and erected the structural steel. Moran, Proctor, Freeman and Meuser and H. G. Balcom Associates were consultants for the foundation, while the latter firm also acted as structural consultants.

R. C. Marshall dropped by Army for accepting fees

Testifying before a House subcommittee on July 9, Brig. Gen. Brehon B. Somervell, chief, construction division, Quartermaster Corps, revealed that Brig. Gen. R. C. Marshall, who held the same job during the last war that Gen. Somervell holds now, had been asked by the War Department to resign his commission as a reserve officer, and that the resignation had become final on July 3. The charges against Gen. Marshall were that he accepted fees from contractors to obtain Army construction contracts for them, although Gen. Marshall maintains that the money was received for consulting services and had nothing to do with obtaining contracts.

The standard contract clause on contingent fees bars such fees for soliciting or securing the contract. It is Gen. Marshall's position that he did not solicit business but merely gave his clients advice on how to deal with the government, both before and after the award of contract. He points out that in addition to a contingent fee he received a monthly retainer. Last fall, the War Department began asking contractors to certify that they were not paying contingent fees to anyone who had assisted "in any manner" in securing the contract. At that time Gen. Marshall cancelled his contingent fee contracts with his clients.

Gen. Somervell also revealed that the War Department had information on at least six other men who represented themselves as being able to secure War Department contracts. All of the information with respect to accepting fees was turned over to the Justice Department, but its report stated that no criminal actions were involved.

The War Department is now withholding sums from the fees of Gen. Marshall's clients equal to the amounts they paid to him.

The companies from which Gen. Marshall is alleged to have accepted fees are as follows: McDougal Construction Co., Atlanta, $1,000; J. A. Jones Construction Co., Charlotte, N. C., $13,500; J. S. Hodgson & Co., Montgomery, Ala., and Dann Construction Co., Birmingham, $7,250; James T. Taylor, Fort Worth, Tex., and Thomas S. Byrne, Fort Worth, $1,750; Mason and Hanger, New York, $7,816; and Consolidated Engineering Co., Baltimore, $500.

• • •

Kingsley Dam dedicated

DEDICATION CEREMONIES were held July 12 for the Kingsley reservoir and dam of the Central Nebraska Public Power and Irrigation District on the North Platte river near Ogallala. The PWA-financed project cost $37,000,000. George E. Johnson is chief engineer.

WASHINGTON HIGHLIGHTS

WAR DEPARTMENT'S request for authority to keep national guardsmen and drafted men under arms beyond their scheduled year of service will, if it is approved, start the new cantonment construction program which has been in preparation for months. Extended debate is likely, but Congress will almost certainly grant the desired authority. If present law restricting the annual increment of draftees to 900,000 is retained, this should give the measure of the cantonment program to be expected. It now seems unlikely that any increase in this number will be asked, unless we go to war, because of the difficulty of arming them next year. However, as arms production accelerates, a larger increment might be sought. The War Department, it is now believed, will not be happy until it has four million men under arms.

AN INVENTORY of all trucks, including work trucks, in the country is to be undertaken in September. Questionnaires asking about location, use, routing, and the like of every registered truck will be sent to owners. Objective is information which will give immediate guidance in priority problems arising from curtailment of automotive output and will help the war department, if it becomes necessary, to requisition vehicles. The inventory is under the general charge of Works Administrator Carmody and is being handled by a Central Motor Truck Transportation committee headed by John L. Rogers of the ICC.

THE PENDING labor stabilization plan for the construction industry, which is being worked out by Sidney Hillman's labor division of OPM (*ENR*, July 3, 1941, p. 37), will not reach final approval for several weeks, perhaps longer. A tentative draft of the agreement has been prepared and is now circulating among government construction agencies; there are a large number of these, each of which has to pass on it. Moreover it may be that it will have to go to the White House for approval. As previously pointed out in *ENR*, the "statement of labor policy" adopted last year by OPM and transmitted by President Roosevelt to Congress is considered by War Department lawyers as having the force of an executive order. On this interpretation, a new executive action would be required to legalize the stabilization agreement, since it departs in several respects from the policy statement. Thus, where the statement requires overtime pay in accordance with local practice, the agreement would standardize overtime at time and a half. Executive action might also be necessary to reconcile the Bacon-Davis prevailing wage law with the stabilization agreement.

• • •

TVA chief design engineer resigns; Rich promoted

H. A. Hageman, chief design engineer of the Tennessee Valley Authority, last month asked to be relieved of active duty because of continuing poor health, according to George F. Gant, acting director of personnel for the authority. Mr. Hageman joined the TVA in January 1937 to supervise the final design of Pickwick, Guntersville and Chickamauga Dams. Five other TVA dams designed under Mr. Hageman's direction include: Hiwassee, Watts Bar, Fort Loudoun, Kentucky, and Cherokee.

George R. Rich, acting chief design engineer during Mr. Hageman's absence, is being promoted to chief design engineer. Mr. Rich has been with the authority since February 1937 in the capacity of head structural engineer, head mechanical engineer and as assistant chief design engineer. Prior to joining the authority he was engaged for many years with the design organizations of the U. S. Army Engineers and Stone & Webster. He is a graduate of Worcester Polytechnic Institute.

Photo by Leo Witt, Jacksonville Journal

New Jacksonville bridge opened for July 4 traffic

Although to be officially opened July 18, the new Main Street highway bridge across the St. Johns River at Jacksonville, Fla., was opened temporarily July 4, 5, and 6 during the daylight hours. Records of state road engineers show that during those three days 50,348 vehicles used the new crossing.

Since about 1920 when the first St. Johns River bridge at Jacksonville was built by Duval County, most of the north Florida traffic has been handled by a three-lane toll bridge supplemented by two ferry boats operated by the Jacksonville Ferry Co. Attempts by various organizations during the past 15 years to obtain a second bridge were realized when the U. S. Bureau of Public Roads April 22, 1937 agreed to pay half the cost of the new bridge or about $800,000 and the Florida State Road Department agreed to include the project in its federal-aid program.

The 350-ft. center lift span of the new crossing is flanked by towers 200 ft. high above the water level and in the raised position the left span provides a minimum clearance of 135 ft. Clearance with the lift span lowered is about 35 ft. The bridge's overall length from shore to shore is 2,060 ft. and its 42-ft. roadway provides four lanes.

The Foundation Co., Inc., New York, constructed the piers, Shell Products Co., Tampa, Fla., built the approaches, The Mt. Vernon Bridge Co., Mt. Vernon, Ohio, did the steel superstructure work, and H. E. Wolf Construction Co., St. Augustine, Fla., paved the approaches. The Florida road department with J. H. Dowling, chief engineer, and E. S. Frazier, state bridge engineer, supervised construction. W. E. Dean acted as state project engineer early in the work, while M. V. Moore acted as project engineer during the project's latter stages. Harrington and Cortelyou, Kansas City, Mo., were consulting engineers, and John F. Reynolds of Jacksonville, Fla., was local consultant.

Interest being revived in concrete ships

Concrete ships are being talked about today, just as they were 23 years ago in a similar emergency. Whether they will be built again, as they were then, is not known, but the old Newport Shipbuilding Co., organized in 1918 at Wilmington, N. C., has been revived with offices in Los Angeles in hopes of resuming building of concrete boats. During the World War the company turned out 26 vessels in 18 months. Most of the key men in the old organization are available if plans for building the ships are carried out. The plans have been presented to the U. S. Maritime Commission and the Emergency Shipbuilding Department.

Newport officials are contemplating a program of ships 5,000 tons or under, fully completed in 120 days, with launchings at the rate of one per week for six weeks and two per week thereafter. A plentiful supply of raw materials is available in southern California, company officials state, where the first yard would be located. Another yard is planned for the Great Lakes or Atlantic seaboard. Barges for transporting oil and other defense commodities are also being considered.

Vacuum process tested

Karl P. Billner, inventor of the vacuum process of curing concrete, conducted tests at the University of Pennsylvania June 21 on vacuum-cured concrete slabs, demonstrating the process as applicable to construction of concrete ships. Compressive strengths as high as 12,500 psi. were obtained, according to reports. Billner claims that with his process forms on the hulls can be removed 15 min. after pouring, thus greatly speeding up construction.

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New Washington highway director appointed

Burwell Bantz, July 1, took office as Washington state highway director, replacing James A. Davis, who has been acting director since Lacey V. Murrow resigned last fall to enter military service. Mr. Davis will remain with the department.

Mr. Bantz, who graduated from the University of Washington in 1909, has worked as engineer for the city of Seattle, the Northern Pacific Ry., the Washington highway department, Lewis and Island Counties, Wash., and the city of Chehalis. In 1929 and 1930 he was construction engineer in charge of Centralia's hydroelectric project at Yelm. Mr. Bantz, a past president of the Washington State Association of County Engineers, also maintained a consulting office in Chehalis, Wash.

JOBS OF THE WEEK

BUILDINGS, San Diego, Calif.

Consolidated Aircraft Corp., San Diego, Calif., received the contract for constructing and equipping buildings at San Diego for the Defense Plant Corp., Washington, D. C. The work is estimated to cost $2,900,000.

PLANT, Houston, Tex.

Southeastern Construction Co., Houston, Tex., has been awarded the contract for constructing a $4,000,000 plant for manufacture of bomber landing gears by Hughes Tool Co., Houston, Tex. The Defense Plant Corp., Washington, D. C., will finance the project for which Robert J. Cummins, Houston, is engineer.

FLYING SCHOOL, Sebring, Fla.

Cleary Brothers Construction Co., West Palm Beach, Fla., was given a $3,627,640 contract for constructing an Air Corps basic flying school with technical facilities. The work is being done by the U. S. Engineers, Washington, D. C.

WOLF CREEK DAM, Jamestown, Ky.

S. A. Healy Construction Co., White Plains, N. Y., was low bidder for construction Wolf Creek Dam and appurtenant works, which is estimated to cost $15,803,890. The project is being carried out by the U. S. Engineers, Nashville, Tenn.

TRAINING SCHOOL, Dothan, Ala.

Southeastern Construction Co., Troy, Ala., and Henderson, Black & Green, Troy, Ala., got the contract for constructing for the U. S. Engineers, Washington, D. C., a training school estimated to cost $3,100,000.

AMMUNITION STORAGE FACILITIES, Talladega, Ala.

Dunn Construction Co., Inc., Birmingham, Ala., and John S. Hodgson & Co., Montgomery, Ala., were awarded the contract for constructing the ammunition storage facilities, magazines, aprons, shelters, and guardhouse fencing at the Anniston Ordnance Depot. The work, estimated to cost $2,109,000, is being done by the War Department, Washington, D. C. J. B. Converse & Co., Mobile, Ala., and A. O. Polk, Birmingham, Ala., are architects and engineers for the project.

FLYING SCHOOL, Valdosta, Ga.

Artley Company, Savannah, Ga., and Espy Paving & Construction Co., Savannah, received a $4,820,500 contract from the U. S. Engineers, Washington, D. C., for constructing the advanced flying school, including clearing, grading, runways, etc. Reynolds, Stockman & Hills, Jacksonville, Fla., are architects and engineers for the job.

AMMUNTION STORAGE DEPOT, Kandaia, N. Y.

Poirier & McLane Corp., New York, and John W. Harris & Assoc., Inc., New York, received the contract for constructing an ammunition storage depot at the Seneca Ordnance Depot at an estimated cost of $6,658,454. The War Department, Washington, D. C., with William S. Lozier, Rochester, N. Y., architect and engineer, is doing the work.

AMMONIA PLANT EXPANSION, Morgantown, W. Va.

E. I. DuPont de Nemours & Co., Wilmington, Del., was awarded contract for designing and constructing the expansion ordnance works in connection with an anhydrous ammonia plant. The $15,848,000 job is being done by the War Department, Washington, D. C.

QUARTERMASTER SCHOOL, Camp Lee, Va.

Doyle & Russell, Richmond, Va., and Wise Contracting Co., Richmond, Va., were given a $2,557,348 contract for constructing a quartermaster school for 900 officers, a replacement center, and other work for the War Department, Washington, D. C.

BUILDINGS, St. Louis County, Mo.

Austin Company, St. Louis, Mo., and Cleveland, O., have been awarded a $7,607,016 contract, including site, for constructing a plant to manufacture airplane gun turrets. Emerson Electric Mfg. Co., St. Louis, Mo., is doing the work, which is to be financed by the Defense Plant Corp.

DAM, Boise, Idaho

Morrison-Knudsen Co., Boise, Idaho; J. F. Shea Co., Los Angeles, Calif.; F. J. Twaits Co., Los Angeles, and Winston Brothers, Los Angeles, were low bidders for the Anderson Ranch Dam work with a bid of $9,986,203 when the U. S. Bureau of Reclamation, Boise, opened bids.

NOTE—Additional bidding and contract news on over 800 projects large and small appear in the Construction News section beginning on page 129.

OBITUARY

ROY M. SNELL, 60, senior engineer for the U. S. Bureau of Reclamation, died June 29 at San Francisco. Mr. Snell was in charge of the railroad and other utility relocations around Shasta Reservoir of the Central Valley project at the time of his death. Following graduation from the University of Maine in 1905, he worked with the Bureau of Reclamation from 1907 to 1915 and again from 1917 to 1924.

C. V. YORK, 65, building contractor of Raleigh, N. C., died July 4.

ERNEST MURRAY, 50, civil engineer of Little Rock, Ark., died July 10. He had been recently employed by the WPA.

ALBERT L. GUNTHER, 47, engineer of Kingman County, Kan., died recently.

WILLIAM J. SLAVIN, engineer of Livingston County, Mich. since 1919, died July 8 at Howell, Mich.

MILES L. TOWER, 48, city engineer of Port Orchard, Wash., died July 5 at Bremerton, Wash. For some time he was assistant county engineer of Cascade County, Mont.

ARTHUR C. WILLIAMS, 90, pioneer builder of Miami, Fla., who was employed on construction of the Overseas Coast Ry. from Miami to Key West, died July 6 in Miami.

LESTER S. DANIELS, 53, assistant engineer in the Boston Transit Department, died July 1 at West Roxbury, Mass. For 30 years he had been engaged in subway, tunnel, and rapid transit construction.

ARTHUR A. REIMER, 65, former chief engineer of the East Orange (N. J.) water department, died at East Orange July 7.

CARL EDWARD MAGNUSSON, director of the engineering experiment station at the University of Washington, died July 10 at Seattle. He joined the University of Washington faculty in 1904 and, after serving as dean for 12 years, was named dean emeritus of the college of engineering last year.

CHARLES E. CANNELL, 68, president of the Charles E. Cannell Co., general contracting firm of Louisville, Ky., died in that city July 3.

LT. COL. WALTER E. WINN, 70, retired army officer and graduate of the Fort Leavenworth Engineers' Training Camp, died June 25 at Little Rock, Ark.

C. S. JOHNSON, pioneer manufacturer of concrete mixing plant equipment, died recently in Lamar, Colo., following an inspection trip to Caddoa Dam. Mr. Johnson designed the mixing plant equipment for Boulder, Grand Coulee, and Shasta dams.

RICHARD NELSON SCOTT, 58, construction supervisor for the Pacific Gas & Electric Co. and former construction engineer for the Twin Peaks and Duboce tunnels at San Francisco, died in Los Angeles July 6.

GEORGE R. BLAKE, 50, general superintendent of the Sawyer Construction Co., Boston, died at Winchester, Mass., July 10.

JACOB J. FLOHILL, 81, retired civil engineer, died last month at Minneapolis. He was a former employee of the American Bridge Co.

CONTRACTS AND CAPITAL

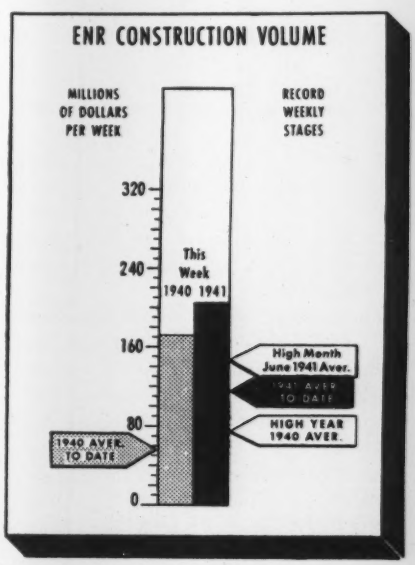
ENGINEERING CONSTRUCTION awards for the week, $206,765,000 as reported by *Engineering News-Record*, place third among record construction weeks. This heavy volume is notable for following immediately after the all time record of last week when $298,718,000 was reported. This brings the average for the past three weeks to $193,000,000 per week compared with the all time record June average of $147,000,000 per week. This week's total is 25 percent higher than the corresponding week last year, itself an all time record up to that time and still the fourth highest week on record.

Public construction for the week totals $189,642,000 of which $155,340,000 is federal, $34,302,000 state and municipal and $17,123,000 private construction. This public construction volume is 25 percent higher than last year, while private volume is 23½ percent higher. Federal construction is 24 percent above the corresponding week a year ago.

The cumulative total is $3,421,095,000, which in 29 weeks is higher than the 52-week records of 1928, 1929 and 1940. It is a gain of 103 percent over the first 29 weeks of 1940, and raises the average construction volume to date since January to $117,965,000, the highest long time average on record.

By classes of work, streets and roads, bridges and waterworks all top their respective volumes for last week. Streets and roads awards with an $18,500,000 week show the highest volume since the record week of June 6 a year ago. Subtotals for the week in each class of work are: waterworks, $3,032,000; sewerage, $1,377,000; bridges, $2,219,000; industrial buildings, $7,598,000; commercial buildings, $8,608,000; public building and private mass housing, $111,318,000; earthwork and drainage, $3,231,000; streets and roads, $18,462,000; and unclassified, $50,003,000.

New capital for the week adds state and municipal bond sales totalling $4,910,000 to bring the cumulative total to $4,922,670, a gain of 194 percent over the previous record last year.



CONTRACTS

(Thousands of dollars)

	Week Ending July 18 1940	July 10 1941	July 17 1941
Federal	$125,736	$242,368	$155,340
State & Municipal	26,205	28,707	34,302
Total public	$151,941	$271,075	$189,642
Total private	13,893	27,643	17,123
TOTALS	$165,834	$298,718	$206,765
Cumulative 1941 (28 weeks)			$3,421,095,000
1940 (28 weeks)			$1,685,088,000

Note: Minimum size projects included are: Waterworks and waterways projects, $15,000; other public works, $25,000; industrial buildings, $40,000; other buildings, $150,000.

NEW PRODUCTIVE CAPITAL

	Cumulative 1940 29 weeks	1941 29 weeks
NON-FEDERAL	$893,603	$795,281
Corp. Securities	92,225	277,590
State & Mun.	523,164	287,918
U.S.H.A. loans	87,204	30,399
R.F.C. loans	7,010	35,874
R.E.A. loans		500
Federal Aid—Hwy.	184,000	163,000
FEDERAL	$783,572	$4,127,389
TOTAL CAPITAL	$1,677,175	$4,922,670

FHA MORTGAGES

	Week Ending July 12 1940	July 5 1941	July 12 1941
Selected for appraisal	$27,852	$24,078	$30,794
Cumulative 1941 (28 weeks)			$811,578*
1940 (28 weeks)			685,779

* Subject to revision.

ENR INDEX NUMBERS

Index Base=100		1913	1926
Construction Cost	July '41	258.18	124.11
Building Cost	July '41	210.22	113.64
Volume	June '41	492	216

Comment and Discussion

Readers' opinions on matters that concern engineers and contractors

High Strength Reinforcing

Sir: There should be no misunderstanding about the effect of the pending bills by the Council of the City of New York to change the law in regard to high yield strength reinforcing. This change, which contemplates reducing the permissible working stress from 30,000 to 24,000 lb. per sq. in., will commercially eliminate the use of twin twisted and stretched high yield point steel (Isteg) because of the higher cost of the latter. It means, should the bills be approved, that the city of New York will be deprived of an economical type of construction, which was proved by tests at Princeton University to give the same safety factor as standard construction.

The Princeton tests were relative performance tests, that is, all beams were made in pairs, as nearly identical as possible except that in one beam of each pair, $\frac{2}{3}$ Isteg steel was substituted for unity standard steel. This method of approach may be distasteful to the theorist, but is it not incontrovertible?

The tests at Columbia University were based on combinations of different steels not in commercial use, and to that extent are "red herring" tests, because while they do not approach the subject in such a way as to prove or disprove the challenge of the Princeton tests, they provide fuel for all kinds of theoretical argument. One thing they did do is to show that higher compressive stresses are not generated by the use of the more flexible twin twisted steel. This is demonstrated by the fact that the Isteg beams designed to fail in concrete compression carried slightly more load than its deformed bar control beam when, because of the greater elasticity of the Isteg, the Isteg beam should have generated a higher compressive stress in the concrete and thus carried less load. But, of course, the theorists will maintain that actual tests should not govern over theoretical results.

The above fact, taken in conjunction with the Princeton tests, demonstrates that within certain limits increased tee flanges are not required if a higher unit steel stress and a more flexible steel is used. This point should be clarified with further tests.

The whole question at issue is: Is a beam as strong as the load that it will carry? or: Is it as strong as a complex and impeached theory says it is? At any rate the writer's clients will continue to enjoy the economies to be obtained by an alternate permitting the use of Isteg steel substitution on a $\frac{2}{3}$ basis when local laws permit it.

This issue has been curiously clouded by emotions. Charges of unfairness or political influence have no bearing on the laws of strength of materials. No, the writer is not retained by the Isteg Steel Co.

ELWYN E. SEELYE
Consulting Engineer
New York, N. Y.

St. Lawrence Traffic

Sir: In the excellent appraisal of the St. Lawrence power and navigation project, published in the May 22 issue of *Engineering News-Record*, the conclusion is drawn that the benefits to be anticipated from the navigation of the proposed waterway do not warrant its cost. This conclusion is based on the premises that the present St. Lawrence and New York State Barge canals can carry all of the traffic that is available, and that but a relatively insignificant part of the ocean freight now passing through North Atlantic ports and railed to and from the Lake region would go up the St. Lawrence in ocean vessels. The latter premise appears to rest largely on an analysis of the present traffic through the canals. These premises appear to be based on a misconception of the efficiency of modern ocean freighters as a means of transportation.

The present water routes between the Great Lakes and the sea can accommodate small light draft vessels only. Such vessels are not economical carriers over long distances either on the Great Lakes or on the ocean. The present commerce through the canals is therefore principally in commodities, largely grain, which can bear the transfer charges to and from canal carriers for the relatively short travel through the canals. These transfer costs include not only the actual costs of handling, but also the ships' time loading and unloading and the storage and brokerage of the goods in transit. As a means of transportation the present canals may be compared to a narrow-gage link in a transcontinental railroad. Obviously, the fact that such a link had adequate capacity to handle the freight would have no bearing on the advisability of its replacement with standard-gage track. As obviously, a prudent management would base the decision on the traffic that could reasonably be anticipated after the improvement, rather than on the economies that could be realized in the handling of the actual traffic over the narrow-gage link. Furthermore, the results secured from an extension of the standard-gage track over half of the distance between the narrow-gage terminals would not be considered of significance in weighing the justification for a thorough standard-gage route.

An analysis of the economies to be anticipated in the transportation of export grain in ocean bottoms from the terminals in the upper lakes to its overseas destination, instead of through the present canals, shows that although the savings would amount to a considerable sum in the aggregate, yet as far at least as the United States is concerned, the amount would fall short of that which would justify the large expenditure required of this country under the proposed agreement for the construction of the waterway.

While the grain trade is an important item of the commerce of the Lake region, it is only one element of the movement of commodities between this great industrial region and the sea. On most of this movement, the costs of a double handling to utilize the present canals, with the related costs and delays inherent hereto, are prohibitive. It does not follow that the water traffic would be similarly limited if the ocean vessels ordinarily used in the commerce of the world could reach Lake ports without breaking bulk. The closure of the waterway during the winter months would curtail such traffic, but to no greater an extent than the closure of the port of Montreal during the same periods.

An analysis of the prospective traffic of the United States through the Great Lakes-St. Lawrence water-

way made by the Board of Engineers for Rivers and Harbors of the War Department in 1933, and published in Senate Document No. 116, 73rd Congress, 2nd Session, indicated a potential export movement of nearly 7,500,000 tons annually with a saving of nearly $45,000,000 in transportation costs, after allowing for seasonal limitations on navigation; and an import movement of about 5,750,000 tons with a saving of $34,000,000. The report pointed out that the commerce analyzed was for the year 1929, which was regarded as exceeding normal expectancy.

It is apparent that anything like such savings on foreign trade alone would justify many times over an expenditure by the United States of $277,000,000, less the amount regained through the disposal of power, together with the relatively small expenditure necessary for the operation of locks in United States territory and the maintenance of the channels; and even after allowance is made for the cost to local interests of the operation, interest, and amortization of the necessary deep water terminals at Lake ports.

An over-all consideration of the foreign commerce of the United States indicates that transportation economies of this order may reasonably be anticipated from the opening of the Great Lakes to ocean commerce. The total waterborne imports into the United States in 1937 amounted to nearly 44,000,000 tons, valued at over 5 billion dollars; and the total exports nearly 53,000,000 tons, valued at over 3 billion dollars. During the same year, imports into ports on the Gulf of Mexico amounted to nearly 6,000,000 tons, and exports 20,000,000. The latter figure is not significant, since a major part is oil.

The area potentially tributary to ports on Great Lakes supports about one third of the population of the United States. It has about twice the population of the area tributary to Gulf ports.

Ports on the Great Lakes are nearer European ports than are those on the Gulf, even after allowance is made for lockages on the St. Lawrence, and the Welland Canal. It certainly is reasonable to expect that the imports into ports on the Great Lakes would largely exceed those to ports on the Gulf, and that the exports would be of the same order of magnitude as the exports.

An examination of railroad tariffs between the Great Lakes area and the seaboard, and of the relative ocean tariffs to ports on the Atlantic and the Gulf, conclusively demonstrates the substantial savings in transportation costs that would be realized through the opening of the proposed seaway.

It is difficult, therefore, to find ground for an assumption that ocean commerce into the Great Lakes would be insignificant, either with respect to volume or with respect to transportation economics. On the contrary, the undoubtedly strong opposition to the seaway may be ascribed to the anticipation that its commerce would become so large as to inflict substantial losses on existing transportation systems, and established importing and exporting agencies. Such losses are an inevitable result of improved means of transportation. Without hazarding an opinion on the fundamental economics of such a situation, the thought may be advanced that a management controlling the entire transportation facilities between the Great Lakes and the sea, and the industries dependent thereon, would not hesitate to provide the most economical transportation system.

G. B. PILLSBURY
Brigadier General, U. S. Army Retired

Hollow Girder Bridges

Sir: The Santa Paula Bridge (*ENR*, June 19, 1941, p. 941) is a notable one. Out of a situation which required a clear span of 120 ft., 54 ft. of roadway and 8 ft. of sidewalks, over a channel subject to intense floods, and with the gradeline quite definitely established at the lowest possible level, there was developed the design described in Mr. Panhorst's article, a design that satisfies all conditions with truly admirable nicety. A feature worthy of mention is the smooth continuous deck soffit, which in cases of extreme flood would assure maximum flow with minimum frictional disturbance.

With the urgent need for reduction of dead load it would appear that the webs at midspan might well have been given a thickness of 5 or 6 in. rather than 14 in. and that the heavy fillets might have been much smaller. The bars bent around the main longitudinal steel and extended diagonally into the webs may perform some useful service. However there are numerous transverse diaphragms, and were these bars entirely omitted it is doubtful if there would be any perceptible change in the bridge's behavior. Slab reinforcement, not shown in Fig. 3, in both top and bottom slabs passes by the ends of the stirrups and effectively ties flanges and webs together.

The article does not mention the amount of camber originally provided but it is the writer's understanding that it was 4½ in. If so the present gradeline remains 2½ in. above the theoretical. For its bearing on other cases it may be observed that if little or no camber had been provided there is no reason to believe that under the given conditions the deflection would have been any less. It is therefore wise to provide adequate camber at the outset.

Cellular concrete girder spans have been built more than twice the length of this one at Santa Paula but the writer knows of none of such relatively slender proportions. A 2-ft. 9-in. midspan depth with a 4-ft.-3 in. haunch depth on a clear span of 120 ft. is undeniably slender. Nevertheless here it stands, demonstrating a number of things. One of these is that to do anything there first must be the will to do it.

This being Federal Aid Project No. 389A indicates credit is due also to the Public Roads Administration for this fine bridge and approval of a design which, though wholly logical and as now attested good and true, can scarcely be regarded as stereotyped and conventional.

HOMER M. HADLEY
Regional Structural Engineer
Portland Cement Association
Seattle, Wash.

Steel Erection at Quonset

Sir: Referring to the Quonset Naval Air Station article (*ENR*, June 5, 1941, p. 68), I wish to call your attention to an error in the caption of Fig. 8. The trusses shown weighed 38 tons instead of 15 tons and were set with two rather than three cranes. The third crane shown in the picture was holding the first truss until bracing could be inserted after erection of the second truss.

H. M. BAKER
Supt. of Steel Erection
Quonset Point Naval Air Station
Quonset Point, R. I.

EDITORIALS

VOLUME 127 NUMBER 3

July 17, 1941

Salvage from Sewage

BYPRODUCT RECOVERY FROM SEWAGE is one of the more intriguing aspects of sanitary science. And despite scoffers who proclaim the impracticability of such salvage ("like getting gold from sea-water," etc.) convincing progress has been made in recent years. Utilization of sludge gas, for instance, is now widely practised for the production of plant power; and the sale of sludge for fertilizer brings in a tidy revenue to many disposal plants. But the most recent, and perhaps the most dramatic example of byproduct recovery comes in this week's news from Baltimore (see p. 37). Here the city has just signed an agreement to sell its sewage plant effluent to the Bethlehem Steel Co. Thus the company obtains a badly needed supplement to its industrial water supply, and the city in turn receives a substantial sum for an otherwise valueless product. This is not the first time that sewage effluent has been employed for a special purpose (irrigation in arid regions and certain oil field uses are not unusual) but we believe that this is the first case where a major industrial plant has turned to sewage effluent for processing needs. As such, it marks an important step forward in salvage from sewage.

Bigger Airplanes

UNDER THE STIMULUS of world-wide war, higher speeds, greater maneuverability and heavier armament are mentioned frequently in announcements of new airplane designs. These advances, however, do not so directly affect the civil engineer and the construction man as do the increases in size, such as that typified by the Army's new B-19 bomber built by the Douglas company at Santa Monica. This ship, with a wing span of 212 ft. and a gross weight of 82 tons, was recently given its preliminary flight test with entire satisfaction to Army officials, it is reported. Germany, too, is reported as experimenting with a ship of similar size. If planes of such dimensions and weight are to be extensively used, some of our present airport standards may have to be modified. The requirements for greater door width and height clearances in hangars are immediately seen, but the necessary runway lengths and type of paving for such heavy loads may not be finally settled until more is known about how such ships handle in takeoffs and landings. Interest in larger airplanes is increasing rapidly and airport designers should carefully note the B-19's performance.

Foundations for Runways

THE ARMY'S HUGE NEW BOMBING PLANE focuses particular attention on the importance of foundations in runway design. Impact on the pavement can be neglected in designing for big bombers because the landing-wheel tires are very large and must carry the relatively low pressure of 80 lb. in order to be safe against rupture at high altitudes, but the supporting value of the pavement must be high under slow moving or standing planes. This means that either the pavement itself must be rigid or else there must be a substantial foundation under the pavement. Rigid pavements are costly, and as the concentrated loads go up, greater pavement thickness is required. Hence, even where rigid pavements are to be used, careful study of the underlying material to determine how to increase its bearing value by one of the available methods of soil stabilization should pay large dividends. Where a flexible pavement is to be used, stabilization of the underlying soil will generally be found to be mandatory. The foundation, in short, makes or breaks the airport runway.

Panama Then and Now

NO BETTER EVIDENCE of how science and engineering have reduced the hazards of tropical construction can be found than in the matter-of-fact way in which building of a highway across the Isthmus of Panama has been undertaken on a schedule calling for completion before the rainy season next year. About half the distance across the Isthmus remains to be built, twenty-four miles. This is not large as a roadbuilding job, but without the facilities now at the command of the builders it would be a formidable task indeed. It is said of the Panama Railroad, which the new road roughly parallels, that there is a dead Chinaman under every tie. But now medical and sanitary sciences have conquered the diseases that plagued the early builders, the nearby canal and railroad make it possible to attack the work at several points, and new and better construction equipment simplifies the physical task involved. What seemed

to be almost insurmountable obstacles over a half century ago when the railroad was built are now conquered by routine operations. And to make the contrast complete, skilled labor, which was brought in by a long and difficult sea voyage when the railway was first built, now is flown in from this country by airplane in a few hours.

Help for the Stepchildren

PROFESSIONAL ENGINEERS in Ohio have undertaken some pioneering in behalf of the stepchildren of the engineering profession—the young men who have completed their scholastic training but who have not had enough practical experience to permit them to qualify for licensing or registration as professional engineers. For under a new constitution (*ENR*, May 29, 1941, p. 852) junior and student grade memberships are established.

Young men in most parts of the country have no active professional society with which to affiliate. A small number in the past have joined the American Society of Civil Engineers as junior members, but that society's concern with the professional needs of young engineers, until quite recently, has been rather limited; its interests are chiefly technical rather than professional. And the state societies of professional engineers, until Ohio acted, have turned a deaf ear to requests that they take in the subprofessional men. In a mistaken belief that by limiting membership to licensed or registered engineers they could attain some semi-legal status similar to that of the bar association, they have excluded the unlicensed men. This left the young men without an organization directly concerned with their welfare except in the few regions where the American Association of Engineers still was active. As a result many turned to trade unions.

The result has not been beneficial to the professional group. It has alienated the younger group who needed help in such problems as readjustment of civil service ratings, pay and classifications. Not that the problems of this subprofessional group were entirely overlooked—because both the state societies and local sections of the A.S.C.E. have given considerable attention to them—but the younger men have lacked the active and continued support that would have come from an organization in which they had a voice.

The lead of Ohio should be followed by the other state societies. Even when viewed from the purely selfish angle of the society itself, the added cost involved in taking in a large number of juniors at a small fee should be justified as a means for continuing a fresh supply of new members who will take an active part in society affairs. But the step has its greatest value in building up the solidarity of the profession. Experience with junior membership in the A.S.C.E. has amply demonstrated that the junior members can make worthwhile contributions to the progress of the society. They will do as much in the state societies of professional engineers if given an opportunity.

Slow Order on Non-Defense Work

INDICATIONS ARE CLEAR that inexorable forces are at work that will bring non-defense construction to a virtual standstill. Most potent factor perhaps is the sheer volume of defense construction demands. Contract awards for the first six months were higher than any similar period in history and last week alone they totaled just under $300,000,000; probably eighty percent of this total represents defense construction.

Government actions too are working toward curtailment of non-defense work. Priority controls, for instance, exert an automatic brake, and there is talk of restricting residence construction by refusing mortgage credit to houses outside defense areas. Further, the President has asked Congress to draft the pending flood control bill in language that will postpone all but defense projects until after the emergency. Under such conditions non-defense construction can only contract.

Few reasons exist for opposing such a course of events. The construction industry has its hands full at the moment. But leaner times are ahead, and projects postponed now will be available when they are badly needed. Planning and design can and should go ahead as opportunity offers. The Federal Works Agency is working along these lines and the National Resources Planning Board is gearing its activities to meet post-war needs. Then when defense construction stops, non-defense work will be ready to take up the slack. Slow orders on non-defense construction now are no cause for regret.

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Fig. 1. Surry Mountain Dam on the Ashuelot River above Keene, N. H., a rolled earth structure 1,670 ft. long and 85 ft. high. The cut at the right is for the channel below the spillway weir. Water from the control gates will enter this channel through a tunnel, the portal of which is shown. Flood control storage capacity totals 32,500 acre feet.

Flood Control on the Connecticut

***Contents in Brief**—Current plans for flood control in the Connecticut River basin are outlined and the location of reservoirs and local protection works under construction or projected is given. Also given are the methods used in selecting reservoir sites, balancing reservoir costs against the cost of protective works along the river and determining the economic benefits of the protection afforded.*

FLOOD-CONTROL WORK now in progress on the Connecticut River is typical in most respects of similar work now in progress at many points throughout this country. For that reason the Connecticut River system has been chosen as illustrative of the manner in which the flood-control programs for our major river systems are carried out. This article treats of the general flood-control studies for the Connecticut; subsequent articles will describe some of the dams and channel improvements that are now in progress.

Construction of ten reservoirs to reduce flood damage in the Connecticut River Valley was authorized in the Flood Control Act of 1936, that valley being one of several in which property damage running to many millions of dollars has been done by floods that swept over the northeastern parts of the country in the spring of 1936. These ten reservoirs had been selected by the Army Engineers from a large number of possible reservoirs as being the most desirable for initial construction on the basis of the limited information then available.

No actual construction was begun in 1936 because Congress, after having authorized expenditure of $10,028,900 on the ten reservoirs, did not appropriate money for that purpose. Studies, however, were continued actively by the Army Engineers, so that by the time Congress came to draft the Flood Control Act of 1938 it had before it a tentative plan for comprehensive flood control on the Connecticut River. The Flood Control Act of 1938 approved this plan of reservoirs, as described in H.D. 455, 75th Congress, 2nd session. The plan called for the construction of twenty reservoirs and seven levee and flood wall projects at a total cost of $47,000,000, to which local interests were expected to contribute $14,178,000 for land and damages, pumping plants, and drainage work. Annual charges were estimated at $2,729,000 and annual benefits at $5,268,000.

The comprehensive flood control plan is now being reviewed by the District Engineer, U. S. Engineer Department, at Providence, in the light of the flood of September, 1938. An interim report on the review was submitted to Congress last year (House Document 724, 76th Congress, 3d Session). It incorporated certain minor extensions to the levee program and a revised list of 20 reservoirs having a total capacity of 939,950 acre-ft. and controlling 26 percent of the drainage area at Hartford. The total capacity of this new group of 20 reservoirs is 46 percent greater than the original plan. More recently the studies were completed and now are being examined by the Board of Engineers for Rivers and Harbors. The new group of 20 reservoirs proposed in the interim report is shown in the table on p. 50.

The 1936 Act called for local participation in the cost of land and rights-of-way. The 1938 Act eliminated this provision insofar as reservoir projects are concerned, but placed on the local authorities responsibility for obtaining lands and rights-of-way for local flood protection works and for protecting the federal government against claims for damages. It also requires them to bear the cost of intercepting sewers and adjustment of local drainage to meet new conditions, while the federal gov-

ernment assumes the cost of pumping plants.

In the calendar years 1936 and 1937 the sum of $1,130,000 was allotted for flood control work on the Connecticut; in 1938 an amount of $7,528,000 was made available from funds appropriated for the Army, PWA and WPA; in 1939 a total of $8,553,000 was allotted; in 1940 $4,060,000 was allotted, and in 1941, to June 1, a total of $3,895,000 had been made available. In addition, local interests have contributed $3,038,000 to pay for the extra cost of special items desired by the locality. Construction of the initial work under the approved plan was begun in the latter part of 1938.

Connecticut River valley

The Connecticut River has its source in northern New Hampshire. flows south forming the boundary between New Hampshire and Vermont, crosses states of Massachusetts and Connecticut to discharge into Long Island Sound. It is 392 miles long and drains 11,260 sq. mi. The upper and western sections of the watershed are mountainous, the ruggedness decreasing as the coast is approached.

Floods have been frequent in the Connecticut River Valley and have produced a serious problem in the highly developed sections of the lower river and in the industrial towns that center around available power sites on the tributaries. The greatest flood of which there is record on the middle and lower river occurred in March, 1936, and caused direct damages estimated at $34,500,000. The flood of November, 1927, which, prior to the flood of September, 1938, was next in magnitude in recent years, was most destructive in the upper basin, notably in the White River watershed in Vermont. The direct damage amounted to $15,526,000. As a result of the heavy rain that preceded the hurricane of September, 1938, floods on the lower tributaries of the Connecticut exceeded all previous records, although the main river at Hartford was 2.2 ft. below the 1936 record. The direct damage caused by the flood of 1938 amounted to $25,596,000. As a result of the 1938 flood, further changes in the flood control plan that had been submitted to Congress are now being studied.

Early in the studies of means for protecting communities in the Con-

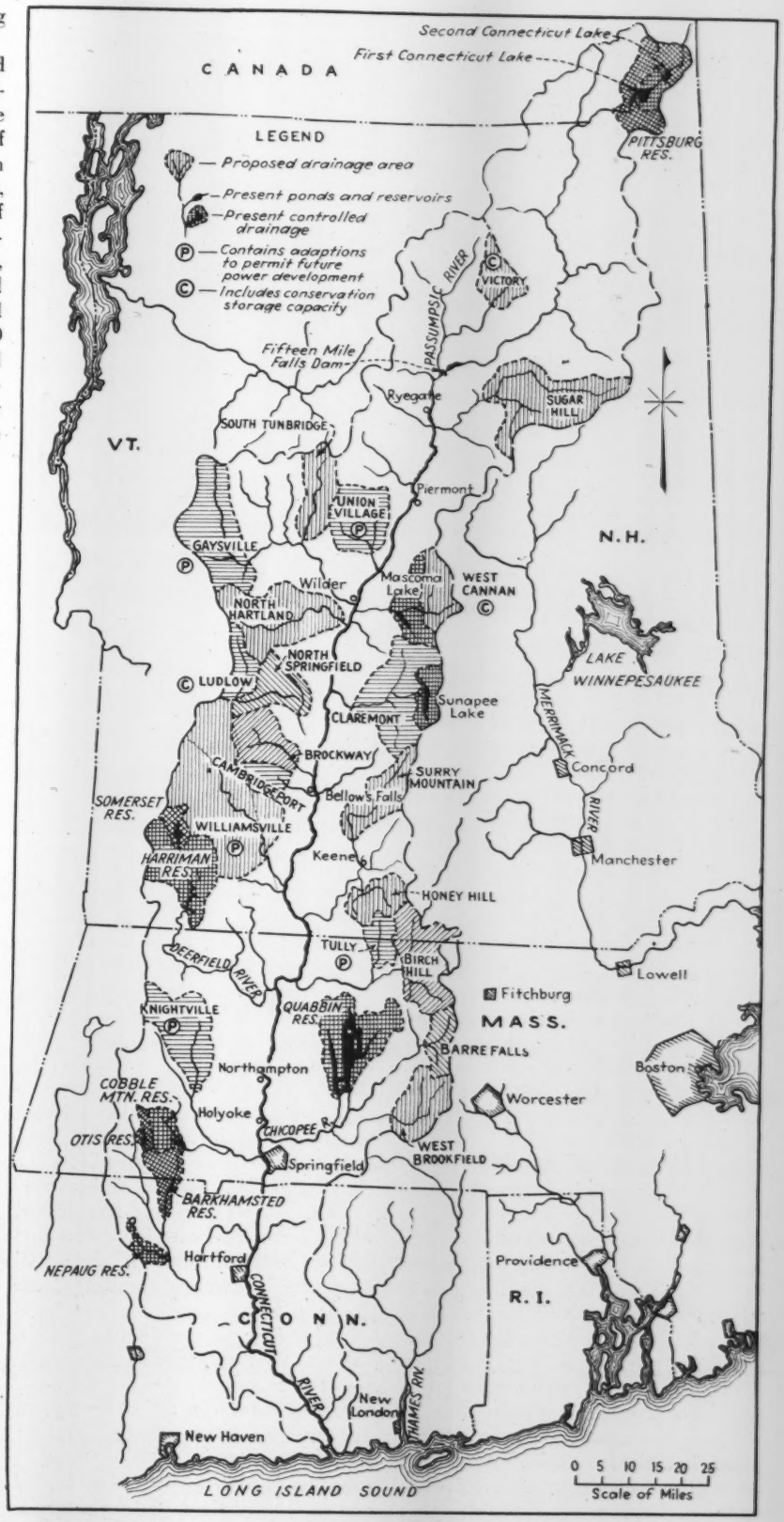


Fig. 2. Flood-control dams now proposed for the Connecticut River Valley will control 26 percent of the area above Hartford. This map shows the drainage areas controlled by existing dams and dams under construction or proposed.

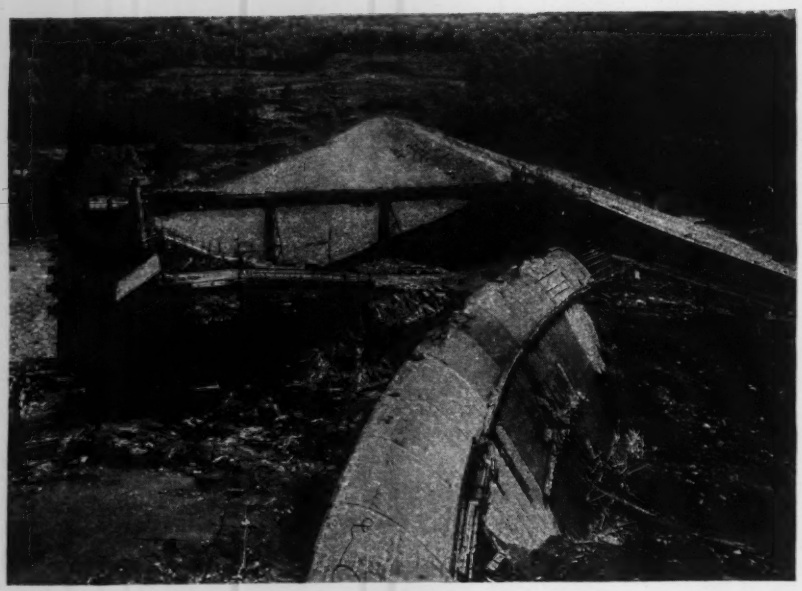


Fig. 3. Knightville Dam on the Westfield River is the farthest advanced of the dams now under construction. It has possibilities for power development.

necticut valley from floods it was found that while complete protection to some of the communities in the lower valley could be provided by means of levees and flood walls, the main reliance in any scheme of protection would have to be placed on a combination of reservoirs and flood walls or levees. Further, it was found that complete protection could not be provided by means of reservoirs, because of the high cost of reservoirs of adequate capacity low enough on the tributaries to keep the flood flows on the tributaries and in the main river within safe limits. Main dependence had to be placed on comparatively small reservoirs located far enough up the tributaries to be above the settled regions where land values are high.

For the design of levees and walls, a design flood was established by assuming an intense rainfall over the watershed and then translating this into runoff by the use of established methods. The discharge from each tributary was computed from the rainfall and the unit hydrograph of that particular stream, and the discharges from these several contributing areas were routed down the main river to produce the hydrograph at critical points in the lower basin. The rainfall assumed was about the same as for the storm of September, 1938, although differently distributed. The unit hydrographs were determined from analyses of previous floods, in general, and the routing computations were made with benefit of careful analyses of previous large floods. A 3-ft. freeboard was originally proposed for levees and walls; this was later increased to 5 ft. for levees and 3 ft. for concrete walls.

Benefits classified

For the purpose of determining the economic justification for the projects under study, benefits were classified as those resulting from the elimination of recurring losses either directly or indirectly due to flooding, and those resulting from the restoration of property values. Flood losses were appraised under three corresponding classifications. A careful determination of the direct and indirect losses resulting from the March, 1936, flood was made as soon as possible after the flood, for use in fixing preventable direct and indirect losses, which form the basis for direct and indirect benefits. Similarly, the actual or probable damage resulting from floods of lesser magnitude was determined, making it possible to place a value on the savings or benefits which result from each foot of reduction of the flood crest. Setting these figures over against flood-frequency curves, it was possible to put the probable direct and indirect benefits on an annual basis, thus giving a figure that could be compared with the annual cost for any reservoir or group of reservoirs.

Flood losses were classified as follows:

(a) *Direct losses*—All direct damage to property and cost of cleanup to private and government interests.

(b) *Indirect losses*—(1) Loss of business and income, and increased cost of doing business to persons and organizations, both private and governmental, in the area; (2) loss of business and increased cost of operations to persons and organizations, governmental and private, outside of the flooded area.

(c) *Property depreciation*—This represents the loss in market value of private properties in the flooded area. It was broken down into (1) depreciation represented by the capitalized value of average annual direct and indirect flood losses to private property in the flooded area; (2) depreciation due to general loss of value because of the undesirability of flooded areas. Since the first item (c) (1) was already evaluated under (a) and (b), it was eliminated from the evaluation of depreciation.

The estimate of depreciation of property values resulting from the flood of March, 1936, was based on interviews with real estate men, property owners and bankers. It was found to vary from 10 to 75 percent of the pre-flood value of the property, being higher in urban than in rural areas. The total observed depreciation was 22½ percent of the estimated assessed valuation of property in flooded areas to be protected by the proposed plan.

Indirect losses were determined by establishing a relationship to direct losses by the sampling method for the various classes of losses, such as urban, rural, industrial, railroad and highway. For the portion of the watershed below the proposed reservoirs, the indirect losses were 94.5 percent of the direct losses.

Depreciation of values

On the matter of restoration of property values, the district engineer found that complete protection could be credited with restoring 80 percent of the observed depreciation in the area protected. Since a minimum return on property in this region is estimated at six percent, the district engineers estimated the annual value of the benefits from the restoration at six percent of the amount of the depreciation restored.

The district engineer credited to

the reservoir system all of the benefits which would accrue to it from reduction of direct and indirect damages, assuming that no levees would be constructed. He also credited to the reservoir system the benefits developed by the restoration of property values outside the areas proposed for levee protection. To the levee system was given credit for the additional direct and indirect damages which it prevented, plus all benefits from the restoration of property values within the leveed area.

The reservoirs proposed in the interim report (H. D. 725, 76/3) control 26 percent of the drainage area at Hartford. Existing water supply and power projects increase this control to about 32 percent. The system of 20 reservoirs will reduce flood heights at Springfield and Hartford by about 5 and 6 ft., respectively, in a flood of the magnitude of that of 1936.

Reservoir size and location

The size of the individual reservoirs was selected to give the optimum ratio of flood protection benefits to annual charges. The locations of the reservoirs were selected to provide the most effective flood protection practical for the basin as a whole, due consideration being given to the sites available and the economics of the situation. Consideration was given to the relative economic values of the individual reservoirs; to the control of the amount of watershed area desired; and to the geographical distribution of reservoirs to obtain dependable reduction of flood stages in the middle and lower reaches of the main river during storms of all probable types and magnitudes.

Spillways were designed for the worst possible conditions, it being assumed that each reservoir would be full to the spillway crest at the time its design flood occurred, even though the reservoirs are normally kept empty.

The costs of the comprehensive plan and the benefits to be derived from it were compared on an annual basis. Reservoir costs were computed at 3½ percent of the capital cost, plus a proper allowance for maintenance, operation, and amortization. The total benefits of the reservoir system proposed in the interim report exceed the total costs of the reservoirs. Similarly, the total benefits of the proposed levee protection exceed the total costs thereof. Extensive reservoir control is highly desirable, since it provides general benefits to the valley as a whole and will tend to increase in value with the normal development and expansion of communities in the valley. A reservoir system must be well distributed over the watershed in order to insure the realization of the benefits credited to the system as a whole, even in the event of a storm such as that of November, 1927, which centered over a limited portion of the watershed. This intangible "location" value may render an otherwise uneconomic reservoir desirable as one element of the total plan, for the case of a storm centering above the reservoir. Levee protection is essential for low-lying congested communities along the main river in order to insure the complete protection which these highly developed communities require. Thus the combined system of reservoirs and levees will provide general protection for the valley as a whole and especial protection for those centers where damages have been concentrated as a result of past floods.

Power and conservation

The most economical and easily improved sites for water-power development in the Connecticut basin have already been developed. The New England Power Association has had under consideration for some years the construction of a large hydroelectric plant at Upper Fifteen Mile Falls, a few miles above the existing plant located at Lower Fifteen Mile Falls.

The only possible water-power sites on the main river below the mouth of the Passumpsic River that have not been developed are at Piermont and Hart Island. Existing plants at Ryegate, Wilder and Enfield do not have equipment of sufficient capacity to utilize additional flows, and until these plants are redeveloped no appreciable benefits to them can be realized from future storage reservoirs. On some of the tributaries there are attractive natural sites for the development of new power stations, but on account of their com-

Fig. 4. Floodwalls and levees are an important part of the protective works along the lower river. Here shown in the stoplog opening for the New Haven R. R. at Hartford.

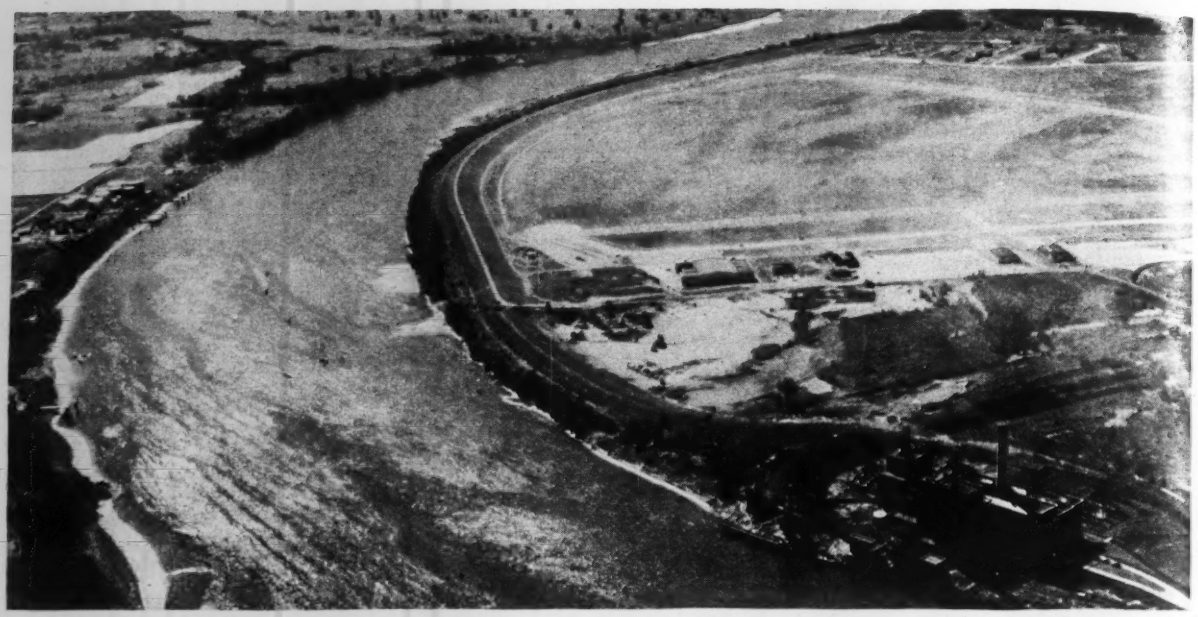


Fig. 5. Brainerd Field at Hartford now is protected against flooding by a dike along the river. A separate dike protects the power station in the right foreground.

paratively small drainage areas and the wide variation in natural flows, these probably never will be developed unless conservation storage reservoirs are constructed above them.

The possibility of increasing the size of flood control dams in order to develop conservation storage or power in conjunction with flood control has been studied. It appears feasible at a few sites, either under present conditions or under assumed future conditions of more extensive power development of the basin as a whole. It is contemplated that, where flood control reservoirs are constructed at sites where power might be developed, provisions will be made so that the dams may be raised in the future to provide the necessary head and storage for power. Likewise, where it is contemplated that additional storage will be provided for streamflow regulation, provision will be made either for raising the dam in the future or, where the regulation is now justified, for providing the additional storage initially.

The possible benefits deriving from small increments of permanent storage to be used for recreation were evaluated, and found, in a few cases, to equal or exceed the costs of providing the additional storage. Such additional storage provides benefits of a local character, and may be provided at almost any of the sites if local interests bear the increment of cost. Recreation benefits are always realized wherever conservation storage is provided.

FLOOD-CONTROL RESERVOIRS PROPOSED FOR THE CONNECTICUT RIVER SYSTEM

Reservoir	River	State	Drainage area sq. mi.	Flood control capacity		Total costs
				Inches of runoff	Acre-feet	
Knightville	Westfield	Mass	164	4.5	39,300	$2,751,000
West Brookfield	Chicopee (Quaboag)	Mass	106	6.0	33,900	2,317,000
Barre Falls	Chicopee (Ware)	Mass	57	8.0	24,300	966,000
Tully	Millers (Tully)	Mass	50	8.3	22,150	759,000
Birch Hill	Millers	Mass	175	5.3	49,900	3,005,000
Honey Hill	Ashuelot (South Br.)	N. H	70	7.0	26,200	1,935,000
Surry Mountain	Ashuelot	N. H	100	6.1	32,500	1,620,000
Claremont	Sugar	N. H	245	6.0	78,400	5,160,000
West Canaan	Mascoma	N. H.	80	8.0	34,100	2,520,000
Sugar Hill	Ammonoosuc	N. H	246	7.0	91,600	6,530,000
Williamsville	West	Vt	400	7.0	150,000	6,280,000
Cambridgeport	Saxtons	Vt	58	7.0	21,600	1,975,000
Brockway	Williams	Vt	101	6.0	32,300	2,944,000
North Springfield	Black	Vt	102*	6.2	33,400	2,018,000
Ludlow	Black	Vt	56	8.0	23,900	2,200,000
North Hartland	Ottauquechee	Vt	222	6.0	71,100	3,630,000
South Tunbridge	White (First Branch)	Vt	102	6.0	32,600	2,275,000
Gaysville	White	Vt	226	7.0	84,300	4,785,000
Union Village	Ompompanoosuc	Vt	126	4.5	30,200	2,376,000
Victory	Passumpsic (Moose)	Vt	66	8.0	28,200	1,415,000
Totals			2752	...	939,950	$57,460,000

* Exclusive of drainage area above Ludlow.

Present work

Construction is now under way on the Surry Mountain, Knightville, and Birch Hill reservoirs. Levees and flood walls at Northampton, Springfield, Chicopee and Holyoke, Mass., are completed or well along toward completion, and those at Hartford and East Hartford, Conn., are under active construction. Details of this work will be given in a subsequent article.

Flood control in the Connecticut River Valley is under the general direction of the Chief of Engineers, U. S. Army. Col. J. N. Hodges is division engineer at New York, and Lt. Col. J. S. Bragdon, now division engineer, South Atlantic Division, Richmond, Va., was district engineer at Providence, R. I., when the work was inaugurated. He was succeeded by Lt. Col. Harley Latson, who now is in immediate charge of the work. T. S. Burns, principal engineer, has direct charge of the design work.

Construction Materials Research and Tests

AMONG THE MANY PAPERS presented at the recent meeting of the American Society for Testing Materials, about a dozen were concerned with tests and investigations of materials used in construction. These papers are abstracted below. A.S.T.M. specification developments were reported in the July 3 issue, p. 3.

Brick Durability

Tests were undertaken at the National Bureau of Standards to study the effect on samples of half bricks of freezing and thawing for 50 cycles using freezing temperatures of 20 deg. F. and —20 deg. F., respectively. The samples included bricks formed by the dry process, soft-mud and stiff-mud processes. The data obtained appear to justify the following conclusions:

Freezing at —20 F. as compared to 20 F. greatly increased the amount of disintegration and breakage on three of the five types of bricks tested. One additional type of brick was so lacking in resistance that there was little difference in the number of specimens surviving 50 cycles by each method, although in 18 of 20 cases freezing at —20 F. produced failure at fewer cycles. The fifth type of brick showed little difference between the two methods.

Freezing at —20 F. tended to produce failure by breaking, while progressive loss from the surfaces of the bricks was the usual type of disintegration resulting from freezing at 20 F. Where failure did not occur there was no consistent difference in the severity of the two temperatures as judged by rate of loss in weight.

At 20 F. the center of a half brick remained at 32 F. for 3 hours while at —20 F. this time was reduced to 15 min. It is considered that rate of freezing rather than temperature is the effective factor in influencing rate and amount of disintegration.

Freezing in an open chamber with an air temperature varying from 20 F. to 12 F. exceeded in severity the effect of freezing in rubber bags at —20 F. when the open chamber freezing permitted unchecked increase in saturation. With an air temperature of 18 F., the bricks required approximately 40 min. to complete freezing—JOSEPH C. RICHMOND and JOHN W. MCBURNEY, *National Bureau of Standards.*

Creosoted Laminated Beams

Although laminated glued timber structural units are common enough, the same units impregnated with a preservative material have not been used, nor the effects of preservatives upon the properties of the glue investigated. A series of tests therefore was run on glued laminated wood beams treated with creosote. Test specimens were 2x2 in. in cross-section and were tested on a 28-in. span with a single load applied at the center. Each beam was made up of four ½ by 2-in. laminations, and untreated laminated beams as well as beams of solid cross-section were tested for comparison.

The results indicated that for all practical purposes the glued and treated laminated beams, when properly seasoned, have the same strength as either the plain beams or the glued untreated laminated beams. As a full-size glued laminated wood beam may be made up of a number of smaller pieces with a greater number of the natural defects eliminated than is possible with a solid beam of the same size, it seems logical to expect that the results obtained from full-size tests would be even more favorable toward the glued treated beams.—WILLIAM A. OLIVER, *University of Illinois.*

Performance of Greases

The Navy Department, dissatisfied with purchasing greases on the basis of composition and physical properties, has been developing methods of specifying them on the basis of performance. To test performance, special apparatus has been developed. For high-temperature service lubricants, a special grease machine has been developed in which a standard ball bearing filled with the test lubricant can be operated at controlled temperatures and speeds while the torque is measured; the grease with the lowest torque and therefore the lowest friction loss is deemed most suitable. Greases that may have to operate at temperatures as high as 165 deg. F. and as low as —65 deg. F. are tested in a special bearing that can be placed in a bath of alcohol and dry ice without wetting the lubricant. A predetermined torque is applied to the bearing and the time required for the initial revolution is determined. The relationship between plasticity of the grease and temperature is similar to the viscosity temperature curve for lubricating oil.

A third test is to detect dirt in grease. The apparatus used consists of a binocular microscope fitted with a micrometer scale in one eyepiece and a mechanical stage. The sample of grease is placed in a U-shaped template on a clean slide and exposed to a 29 to 30-in. vacuum for 10 min., after which a cover glass is placed over the sample. Exposure to vacuum removes entrained air bubbles and clarifies the sample for examination. Magnification of 60 diameters has been found most suitable. The sample is illuminated simultaneously from below and transversely. The observer counts the particles as they pass the eyepiece scale.

The performance specifications indicate the possibility of overall economy from using very expensive greases. For example, chassis lubrication of a passenger automobile at 1,000-mile intervals for an estimated 15,000 miles per year would cost $16.20 with labor at $1 per lubrication and grease at 8c. per pound. Using a Navy aeronautical grease, lubrication would be required at only 7,000- to 8,000-mile intervals. This grease could cost as much as 70c. per pound and still provide lubrication for one-third the cost of ordinary grease.

Tests of Structural Alloys

Tension and compression tests were made on 33 samples of carbon structural, silicon structural, and low-alloy steels at the Fritz Engineering Laboratory, Lehigh University. Samples were tested both with and across the direction of rolling. One of the principal purposes of the investigation was to obtain information on the

compressive stress-strain characteristics of structural metals. Comparisons between the yield points in tension and in compression are particularly significant because they indicate to what extent the tension test may be relied upon to provide information regarding the compression stress-strain characteristics of the material. A screw thread test specimen was adopted with a gage length of 2 in. and a diameter of 0.505 in. All tests were made on a 60,000-lb. hydraulic testing machine and unusual care was exercised in designing the gripping device for the tension test and the bearing blocks for the compression test. One of the important parts of the investigation was determination of the values of the upper and lower yield points. The upper yield point is the ordinary "drop of the beam" yield point while the lower yield point is the lowest stress at which a slow continued increase in average strain is maintained after passing the upper yield point. In effect the lower yield point corresponds to the "yield strength" as measured by the arbitrary offset method.

The tests resulted in the following conclusions:

The average values of the upper and lower yield points of each type of steel tested were practically the same in compression as in tension.

The general shape of the individual stress-strain curves up to the upper yield point and into the lower yield point range were very nearly alike in tension and compression, except that the proportional limits were usually higher in compression. The greatest differences between tension and compression stress-strain characteristics were noted for the cross-roll direction in the silicon steels.

The upper yield point averaged 8 percent higher in tension and 6.4 percent higher in compression than the lower yield point with approximately the same difference for each class of steel.

The average ratio in tension between upper yield point and nominal maximum stress was 0.56 for carbon structural, 0.55 for silicon structural, and 0.65 for the low-alloy steels, with very little difference in the ratio with or across the direction of rolling.

Silicon structural steel was found to have the greatest directional variation and the least ductility of the steels tested.

The elastic constants were not affected by the direction of rolling.

The most definite directional properties were found to be associated with the behavior of the materials beyond the maximum load.—BRUCE JOHNSTON, *Lehigh University*, and FRANCIS OPILA, *Baldwin-Southwark Corp.*

How Fatigue Values Vary

Summary of many fatigue tests made with different types of testing machines show the following mean values for endurance limits: heat-treated alloy steel—rotating beam machine, 80,000 lb. per sq. in.; vibratory machine, 80,600 lb.; axial stress machine, 76,000 lb. Low alloy steel—rotating beam, 44,100 lb.; vibratory, 47,200 lb.; axial stress, 39,000 lb. Duralumin—rotating beam, 15,000 lb.; axial stress, 14,000 lb. It may be noted that for vibratory tests of round specimens only one pair of extreme fibers, top and bottom, are subjected to maximum stress, while on rotating beam tests all the surface fibers are subjected to maximum stress. In the case of the axial stress tests, the whole cross-section of the specimen is subjected to maximum stress.

In vibratory tests it has also been found that flat specimens in general, give lower values than round specimens.—H. F. MOORE, *University of Illinois.*

Shrinkage vs. Plastic Flow

The problem of time yield of concrete under sustained load (plastic flow) has for many years been approached on the basis that unit shrinkage in a direction parallel to the axis of a loaded concrete cylinder was uniform over the whole loaded cross-section. The writer contends that non-uniform shrinkage (as between the surface and the interior concrete) accounts for most of the excess time yield noted for loaded over unloaded cylinders at ages under one year.

The fact that shrinkage of concrete is related to, although not directly proportional to, moisture loss of concrete, has long been recognized. It would be reasonable then to expect that if loaded concrete shortened more than unloaded concrete it should perhaps lose more moisture, and the term "seepage" has crept into the literature of plastic flow as a phenomenon which assumes that colloidal moisture is squeezed out of concrete in somewhat the same fashion as water might be squeezed out of a sponge; this moisture loss is contemplated in addition to the shrinkage water loss which is common to both loaded and unloaded specimens. However, tests where great care was taken to assure the same surface exposure and the same humidity of surrounding air in both loaded and unloaded specimens show that moisture loss depends only on the humidity of surrounding air and is not affected by loading; seepage, therefore, does not exist under working load.

Surface concrete dries out more rapidly than interior concrete, and consequently shrinks more rapidly. Such non-uniform shrinkage immediately gives rise to balanced internal stresses in the unloaded cylinder such that the total tension induced in the outer ring section is equal to total compression induced in the central axial core. The longitudinal tensile strains induced in the outer ring are decreased by the "Poisson's ratio" effect of the lateral or circumferential stresses induced in the same outer ring. This tendency to decrease the surface gage line readings is largely counteracted by the annular shearing strains set up between inner compression core and the outer tension ring as one opposes the other. It is reasonably accurate to assume that both these deformation effects are not only small but counteractive. This leads directly to the conclusion that in the unloaded specimen the shrinkage strain recorded by surface gage line readings is closely equal to the induced shortening of the compression core of the cylinder.

Proof of the nonuniformity of shrinkage throughout a mass of concrete was given by the results of tests on 6 and 12-in. concrete cylinders split into four equal quarter segments by heavy rubber gaskets, in comparison with those of corresponding solid speciments. The split segments on drying out immediately started to warp in a manner such that the outer surface of the segment is concave outward in a longitudinal direction, due entirely to the more rapid surface shrinkage. Both solid and split cylinders lost the same percentage of moisture since both had the same exposed surface, the rubber gaskets preventing moisture loss through the radial cracks between segments.

Comparative tests were also made on the solid and hollow cylinders. In the hollow group the time yield tended to be the same for both loaded

and unloaded specimens because of absence of the restraining center core while in the solid group typical doubling of the time yield in loaded as compared with unloaded cylinder was observed. In the loaded specimens of the solid group a recovery is observed after load removal, which is just as much an elastic change as the doubled time yield of this specimen. This has been called "plastic recovery" but the common usage of the term plastic flow assumes that it is the *permanent* change of shape due to the load which cannot be recovered when the load is released. All recovery must be elastic from its very nature.

Concrete columns with longitudinal compressive steel, when tested for time yield lead to similar conclusions regarding the non-importance of plastic flow under working load conditions.

All of the evidence available seems to point to the dominance which shrinkage exerts over all time yields occurring under working load conditions. That some small amount of flow might exist under working load is not denied, but it is quite evident that all the important time yields under load which in the past have been attributed by all investigators to plastic flow are merely elastic distribution of stress and strain due to nonuniform shrinkage or warping.—GEORGE A. MANEY, *Northwestern Technological Institute.*

Test Cylinder Capping

Results of tests on concrete cylinders to determine the compressive strengths are affected by the method of capping and the kind of capping material, and also by the end conditions of the uncapped cylinders.

To determine the effect of end conditions and the method and material used in capping, a series of tests was conducted on 3x6-in. cylinders having a maximum aggregate size of $\frac{3}{4}$ in. They were cast in two series having nominal compressive strengths of 3,000 and 8,000 lb. per sq. in., respectively. Before capping, all specimens of each group had various end conditions: plane, plane beveled, convex, and concave. The two ends of each cylinder were shaped alike.

Tests were made on the following capping materials: plaster of paris; Hydrostone; Castite (a molten mixture of sulphur, and finely-divided silica similar to Leadite); and $\frac{1}{16}$-in. steel shot, both dry and oiled, with a suitable retaining head.

Relative costs of the various methods of capping may be summarized as follows: (1) Hydrostone is the most expensive material, also the labor cost is relatively high due to the time required between applications of top and bottom cap. (2) Castite is high in initial cost but it has a high salvage value; for fairly regular ends this method is speedy and has the lowest overall cost. (3) Shot caps cost practically nothing for materials, but the cost of cleaning the shot, especially when oiled, partly offsets this feature. (4) The plaster of paris is inexpensive, but the cost of applying it is the same as for Hydrostone and greater than for Castite.

Other results may be summarized as follows: Regardless of end conditions the highest strength and the greatest degree of uniformity of strength were obtained when using Hydrostone or Castite caps. Shot caps do not develop the full strength of the concrete, and they give especially low strength when testing specimens of concave ends. In general, there is little difference between results for oiled and dry shot. Plaster of paris caps on cylinders of normal-strength concrete having plane ends develop strengths comparable to those obtained by the use of stronger capping materials, but they give very low strength for other end conditions, especially on cylinders of high-strength concrete. Cylinders capped with Castite may be stored under moist conditions for long periods. Considering overall cost of labor and materials Castite caps are cheaper than those of other materials. G. E. TROXELL, *University of California.*

Air Content of Concrete

The growing interest in cements containing organic admixtures, such as fats or resins, which increase the air content of concrete makes a standard method for calculation of air content advisable.

Effect of air content, especially that part contributed by these new admixtures, on the physical properties of concrete is still a relatively new subject. It is recognized that very small quantities of these additions greatly increase workability and resistance to frost action and generally decrease strength and lessen permeability.

Decreases found in concrete strength, especially in the richer mixes, are not unexpected when the fact is considered that the increased air content is confined to the volume occupied by the cement paste, or at least by the cement mortar. A surprising feature is that the strength of lean mixes, where air content is high.

Control of air content in concrete by specification limits would seem ill-advised at this time. Results obtained are so dependent on cement content, concrete consistency, and even method of mixing, that a specification of this sort would have to cover an extremely wide range of values. However, under field conditions where fixed proportions of materials are being used, determinations of air content or even unit weight, used in conjunction with consistency measurements, will provide valuable means for control of concrete uniformity.—M. A. SWAYZE, *Lone Star Cement Corp.*

Limes and Lime-Mortars

As a result of a study of the physical characteristics of seven lime hydrates (three of high calcium and four of dolomitic type) followed by a study of the effect of these physical characteristics upon mortar made with the limes, certain conclusions were arrived at. Hydrated limes may be roughly classified as regards their plasticizing ability in a mortar by examining the mixing water requirements for a mortar of fixed sand content and consistency; in general, the higher the mixing water requirement, the higher the plasticizing ability. Sand-carrying capacity of lime depends directly upon the ability of the lime paste to cohere and hold the sand in suspension while the mortar is at rest or during transportation or deformation. Harsh-working mortars are the result of using a matrix which does not possess the above characteristics or in which the suspending capacity of the paste is exceeded by using an excessive amount of sand.

The tests showed no apparent relation between plasticity and flow-after-suction or between plasticity and sand carrying capacity. However, a rough relationship existed between flow-after-suction and sand carrying capacity. Likewise, there is a rough relationship between the immobile water factor and the flow-after-suction. Hydrated limes may be roughly classified as to their plasticizing ability in a mortar by sedimentation tests and the determination of the immobile water factor.—HOWARD R. STALEY, *Massachusetts Institute of Technology.*

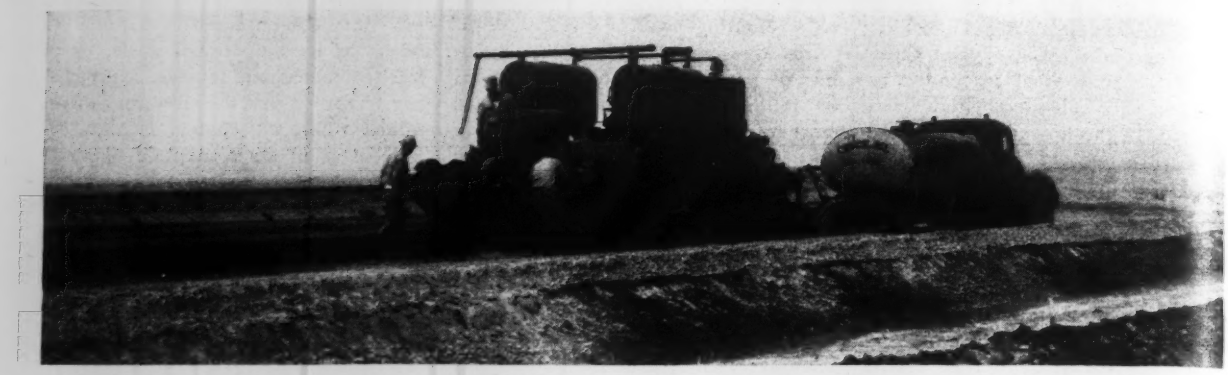


Fig. 1. Traveling asphalt plant paves 300-ft. runways, which are designed for an ultimate width of 1,000 ft.

Building the Corpus Christi Naval Air Base

***Contents in Brief**—The $28,000,000 air training station just completed by the Navy at Corpus Christi, Tex., involved many types of construction, such as general grading, buildings and hangars, road and runway paving, utilities, marine and railroad work. To meet the fast schedule of eight months to the time of commissioning the base and one year for full completion, the contractor set up 38 different departments.*

ON MARCH 12, 1941, exactly eight months after the title was obtained to 2,050 acres of sand dunes, covered with mesquite, bay trees and shin oak, the huge U. S. Navy air training station near Corpus Christi, Tex., was commissioned although construction was not complete. By June 30, the designated completion date, the $28,000,000 project was substantially complete, 11 months from start of work. The successful prosecution of the big job is due to the cooperation of the Navy, represented by Commander L. N. Moeller, officer in charge of construction, and the architect-engineer, Robert & Company, Inc., for whom H. W. Howarth is resident manager, and to the splendid organization built up by the contractor, the combined firm of Brown & Root, Inc., W. S. Bellows, and Columbia Construction Co.

The Corpus Christi Air Training Station is officially classed as a temporary base, but hangars, shops and warehouses are steel and concrete construction; barracks and school buildings are well-built frame that will have a long useful life.

The station consists of four main parts. At Flour Bluff, a point 12 miles southeast of Corpus Christi, jutting into Corpus Christi Bay, is the main base. From 5 to 13 miles south and west are three auxiliary base fields, designated during the construction period as P1, P2 and P3, which include large landing fields, hangars and barracks, completely equipped for training of at least two squadrons independent of the main base.

At Flour Bluff, so named because of the flour-like fineness of the dune sand at the site, are facilities for both land- and seaplanes. The initial program includes three seaplane and three landplane hangars of standard navy design. Provision has been made for five additional land- and three more seaplane hangars. Concrete aprons and warming-up platforms lie in front of all hangars. Runways and ramps, also concrete, lead from the seaplane hangars into the waters of the bay. Adjacent to the landplane hangars is a landing field of four bituminous-paved runways, each a mile long and 300 ft. wide, designed for a future width of 1,000 ft. if required. At the intersection of the runways the paving has already been widened.

Along the bay front is a bulkhead wall 5,525 ft. long, terminating in a pier 98 ft. wide, extending 492 ft. into the bay. A navigable area around the pier is dredged to a 30-ft. depth. For the most part the bulkhead consists of a sheetpile wall of 36-lb. arch-web steel sheeting 14½ ft. long, except every fourth pile is 17½ ft., driven to a uniform top level of El. 9.5. At intervals of 9 ft. 9¾ in. the wall is tied back to a group of three 6-ft. sheetpiles by a 1¾-in.-dia. rod 25 ft. long. Toward the west end, where the water gets deeper, the standard section piling is replaced with long Z-section piles, penetrating to El. —50. In this area the tieback wall is a continuous line of 12-ft. sheeting (every fourth pile 18 ft. long); tierods are 2¾ in. dia., 80 ft. long, spaced 6 ft. apart. The main wall is incased in concrete 4 to 6 in. thick, from El. —2 to +9.5, and topped by a concrete parapet, 15 in. wide. All of the wall work was done inside an Ohio River type box cofferdam.

Extending over the wall at six locations are concrete-deck ramps for the seaplanes. The ramps are supported by H-section steel piles. About 1,500,000 cu. yd. of fill has been placed behind the wall, partly by dredging for the 30-ft. depth area. To the east of the point (east end of the wall) lies Demit Island, reclaimed by dredge spoil for ammunition storage and connected to the mainland by a dredge-fill causeway.

Buildings

Besides the six hangars, the main base includes a large number of buildings. In the industrial area, all of steel, concrete and masonry construction, are a big assembly and repair shop, aircraft storehouse, powerhouse,

garage, general storehouse, laundry, paint and oil storehouse, cold storage plant and a motor test building.

The assembly and repair shop, largest structure in the station, is a steel frame with asbestos-protected metal siding. The main warehouse is reinforced-concrete, while smaller buildings in the industrial group are generally of light steel construction with brick walls. Foundation conditions are good, simple concrete spread footings are adequate for all structures. Rails for the hangar doors are carried on a large reinforced-concrete beam. Facing the industrial area is a two-story frame administration building, which is the base headquarters.

Enlisted men will be quartered in eighteen 250-man barracks of standard design. These are two-story frame buildings, H-shaped in plan with concrete foundation walls and first floor. Exterior walls are double wood, with a layer of tarpaper between diagonal inner sheathing and the drop siding exterior. All walls, partitions and ceilings are finished with wallboard. Drop siding was primed with aluminum paint as soon as it was received to keep the lumber from warping in the hot, dry winds of that locality. The roofing is built-up asphalt, covered with crushed brick instead of the usual fine gravel. Heater rooms are located in small basements excavated under each building; heat is supplied from a central plant. The barracks

Fig. 2. There wasn't time to grade the access railroad, so part of the line was laid on county roads. Trains were in operation 28 days after work started.

are arranged in two groups around two one-story subsistence (mess) buildings and a bakery. Four recreation buildings serve the enlisted men's group.

To house the naval flying cadets at the station are 10 barracks of similar design, except the ground plan is E-shaped. This group is served by two subsistence and three recreational buildings. The ground school facilities include seven H-shaped, 2-story frame buildings. The hospital consists of 9 wards, a main operating building, and a subsistence building.

Ten substantial houses were built for the senior officers. Bachelor officers are housed in six E-shaped barracks.

Located within the main reservation is a housing project of 350 buildings for married enlisted men. These structures are being built by the general contractor. Outside of the reservation, across Cayo del Oso, the wide bay that lies to the west, is a USHA housing project of similar size, being built by another contractor, to take care of 400 civilian workers and their families.

Access

The main highway access to the Flour Bluff site at start of work was an 18-ft. concrete road, known as Ocean Drive, along the south shore of Corpus Christi Bay. Part of it is low, exposed to flooding in time of

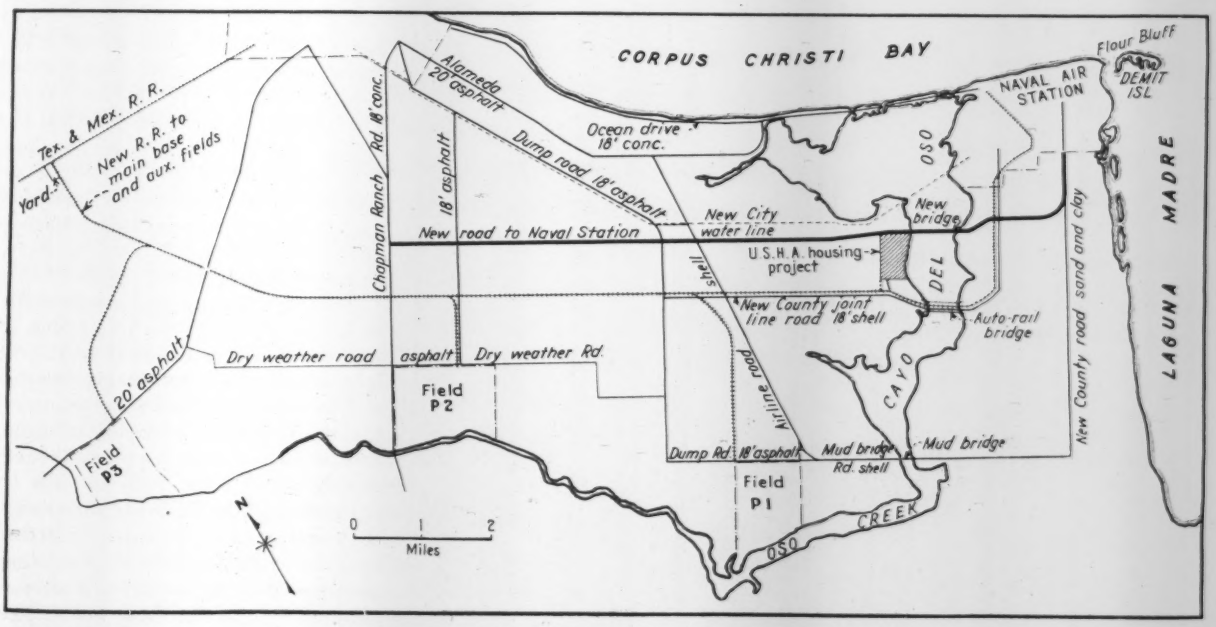


Fig. 3. Map of the area embracing the main and auxiliary fields. Narrow Ocean Drive, back county roads and the temporary railroad provided early access. Only one of the two ultimate 22-ft. lanes is being built at present.

storm. Last fall, Nueces County built two new roads into the back or south side of the main base with shell surfacing 18 ft. wide. These two routes provide access from the main base to the outlying fields. However, these three roads are inadequate to serve the station properly, so the Navy, Nueces County and the state are cooperating in building an 11-mile concrete road from the south gate to Chapman Ranch Road, which runs direct to the city. Eventually this will be a divided-lane road with two 22-ft. paved strips. Only one lane is being built now. This route includes a pile trestle with beam and slab deck; 28 ft. wide and 1,200 ft. long, over Cayo del Oso. The state made the preliminary surveys and prepared the plans and specifications. Nueces County is furnishing a 160-ft. right-of-way and land for borrowpits. Construction of the road is by the Navy, with Navy and county funds, the work being done by the base contractors as an extension of their original contract for the base.

Because of the large amount of materials and heavy equipment involved in building the station, it was necessary to get a railroad into the site as soon as possible. A temporary line, 18 miles long, was built from the main line of the Texas-Mexican R.R., southeast of Corpus Christi, into the main base. The first train went over the line 28 days after start of construction. A 3,000-ft. crossing over the bay and low land west of the base includes long approach fills and a 1,000-ft. combined railroad and highway trestle, the highway portion being part of one of the new county roads. For some distance the railroad uses part of a county road for right-of-way. Grading was light, and shell, gravel and sand were used for ballast, whichever was most readily available. Some of the track material was purchased, and part was leased from railroads. After the line was completed to the main base, three branches were built to tap the outlying fields. Including a yard at the junction of the main line and construction service branches within the main base, 4[illegible] miles of temporary track was laid.

At present shallow water blocks access by sea to the main base. However, in the current Rivers and Harbors appropriations are funds totaling $2,700,000 for a 30-ft.-deep channel from the station to the navigation channel in Corpus Christi Bay.

Fig. 4. Heavy grading equipment leveled the site and built the roads at the main base. Below is shown a homemade rig found effective in grinding up mesquite roots, sharpened angles welded to a smooth roller. Grading required the moving of nearly 2,000,000 cu. yd. of material.

Grading

The original site of the main base was dunes of fine blow sand up to El. 40, covered with mesquite, shin oak and bay trees. Plans called for general grading of the site to about El. 12, requiring moving of nearly 2,000,000 cu.yd. of material. Grading started early in July. The sand was found to be very abrasive, for example, tractor tracks and rollers with a normal life of 2,500 hr. had to be replaced every 400 hr.

After the ground had been cleared, long roots bothered the grading equipment. After some experimenting it was found the roots could be ground up into harmless short lengths by a home-made chopper consisting of sharpened angles welded transversely to an ordinary roller.

Underlying the sand, at roughly El. 4, is a clay formation. To make handling of the fine sand possible and to permit equipment operation, the entire volume of sand in both original site and in the dumps, was kept moist down to the clay. This required an elaborate system of jets and feeder lines from 2 to 8 in., served by an 8-in. pump. Clay pits were opened up for material to stabilize all but the most temporary haul roads. As far as possible, haul roads were laid out on the future permanent road locations, but to subgrade level to serve as a base for the future roads.

Grading equipment included 12 scraper units from 8 to 15-yd. size, 3 shovel and 10 dragline outfits. At first large hauling units were tried, but the cost of stabilizing haul roads to carry the units led to adoption of light trucks for serving the shovels and draglines.

Grading of the three outlying fields required moving another 1,000,000 cu.yd. of material. The same grading outfits used at the main base were distributed among the three fields. The ground was entirely different, however, being a black, waxy soil that

gave some trouble in moving it at two of the fields.

Local materials were utilized for paving the runways. At the main base landing field 746,000 sq.yd. of two-course asphalt paving was laid in the runways and taxi strips. The base or first course is a 3½-in. thickness of cold mix, laid by a traveling plant in 10-ft. strips. The mix consists of 7½ percent emulsified asphalt, 46 percent of washed shell, 46 percent Flour Bluff sand and ½ percent lime. Shell was dredged and washed at a reef 40 miles away and hauled to the main base by barge, where it was crushed and screened at a shoreline plant having a capacity of 45 carloads per day. For use at the main station, the shell was batched into trucks; for outlying fields it was loaded into railroad cars.

Paving procedure

The first course paving process was to dump and windrow the shell, then dump the sand, obtained from borrowpits, and mix the two with patrol graders into a uniform windrow. Then the lime was added. Next the mix was put through the traveling plant, where the asphalt was added. After being deposited by the mixer, the material was spread by patrol graders, and then rolled with a pneumatic roller, followed by a finish rolling with a 3-wheel 8-ton roller.

The top course at the main landing field is a hot mix 1½ in. thick, consisting of 8 percent asphalt, 64.4 percent Four Bluff sand, 23 percent shell and 4.6 percent stone dust. It was prepared at a hot mix plant, hauled to the runways in trucks and placed by spreaders.

At the outlying fields all except one of the runways are a 5-in. one-course cold-mix paving, made up of 55 percent shell, 15 percent concrete sand, 21½ percent Flour Bluff sand, ½ percent lime and 8 percent emulsion, topped with a hot asphalt and sand seal coat. Construction is similar to that of the main station base course. The three outlying fields required a total of 1,646,000 sq.yd. of paving.

One runway is a 6-in. stabilized cement and concrete sand base. It was necessary to stabilize the subgrade on all these runways. The black clay has a high plasticity index, which was lowered from 7 to 9 by treatment with sand. To 3 in. of black clay surface, pulverized by disc harrows, was added 3 in. of sand, mixed into the clay by further disking. This mixture formed the runway subgrade.

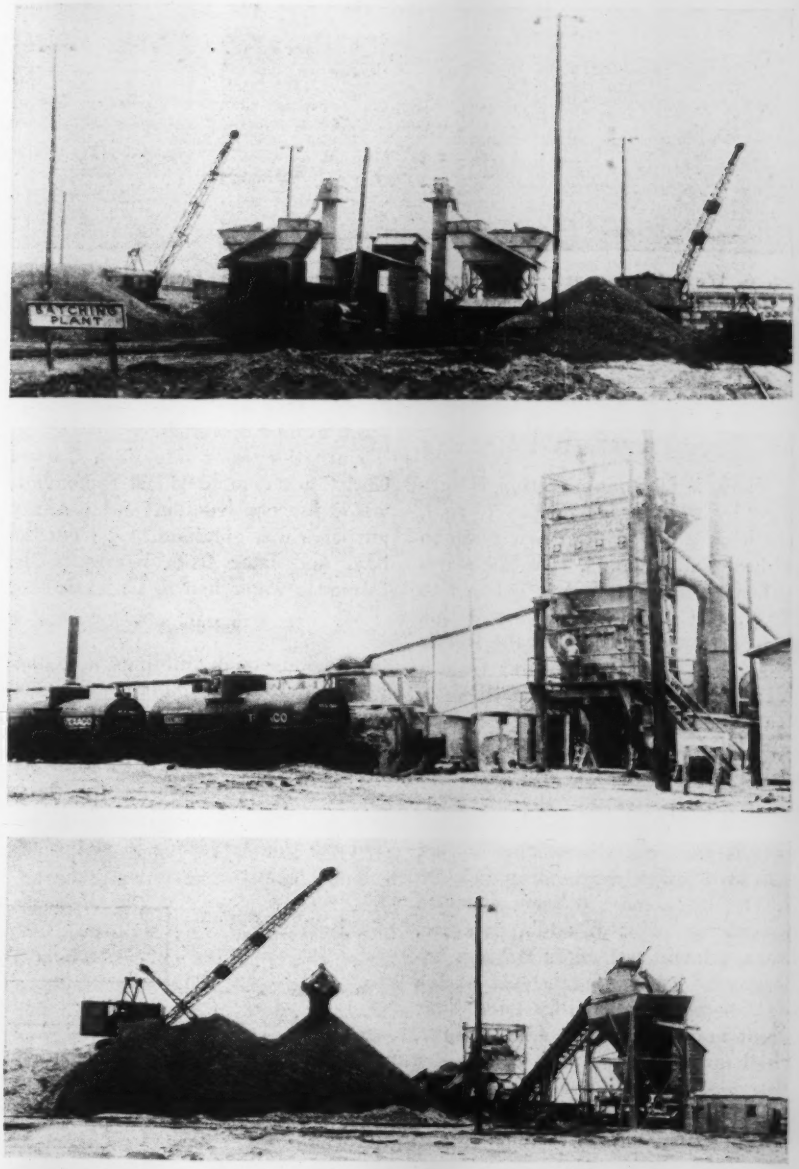


Fig. 5. Three material-processing plants at the main base. Top: concrete batching plant, from which concrete was transit-mixed to the various locations; center: hot asphalt plant for the runway top courses; bottom: shell washing and grading plant, where 35 carloads of processed shell for runways and roads is turned out daily.

Runways at Fields P2 and P3 are of conventional design, but the layout at P1 is two 1,500-ft.-dia. paved circles, 750 ft. apart, connected by a paved strip 400 ft. wide. This arrangement is for primary training, so the planes can land and take off in any direction.

Roads around the industrial area of the main station are mostly concrete, as also are the plane parking areas, warm-up platforms and hangar floors, totaling 250,000 sq.yd. All concrete is 6-in. uniform thickness, laid in strips 20 ft. wide with wire mesh reinforcing. All aggregate comes in by rail. The mix is 6 bags of cement per cu. yd., curing is by cotton mats. Traffic is kept off the concrete for 7 days, then only light vehicles are permitted for several days longer. At the outlying fields are 70,000 sq.yd. of concrete paving. Concrete is batched at a central plant at each field, mixed and delivered in transit mixers.

Other roads around the fields include an asphalt type of a 3½-in. base and a 1½-in. top course, both plant

Fig. 6. Waterfront construction includes a seawall and seaplane ramps (left). The concrete-encased sheetpile seawall is tied back by sheetpile anchors (right). About 1,500,000 cu. yd. of fill was placed behind this wall.

hot mix. Some cold-mix penetration type asphalt roads are also being built.

Utilities

Water for the main station is supplied by the city of Corpus Christi, which built a 67,000-ft. new main to the reservation limits. This line starts with a 24-in. pipe, but is reduced to 16 in. at Cayo del Oso. Across this body of water 5,000 ft. of the line is 16-in., laid with bolted joints from a barge in a trench excavated by a floating dragline. Elsewhere the city's installation is bell-and-spigot with cement joints. The city also furnishes water to the three outlying fields.

Inside the reservation all water pipe is cast-iron, from 2 to 16 in., with lead joints, aggregating 175,000 ft. The 16-in. main delivers water to a pumping plant at 60-lb. pressure. Storage facilities include a 2-mg. underground concrete reservoir and a 500,000-gal. elevated steel tank. Four 10-in. mains lead into each hangar, which are equipped with the deluge system of fire fighting.

The sewage disposal plant for the main station includes primary and secondary settling tanks with sprinkling filters, a sludge digester, and sludge drying beds. The effluent will be chlorinated and discharged into the bay. Sewer lines, all vitrified clay pipe with asphalt joints, run from 8 to 24 in. Two lift stations pump the sewage to the plant.

Because the sandy soil at the Flour Bluff site offers natural drainage, only a limited storm drain system is planned for the present. To save tearing up the runways in case a drainage system is required later, sewers have been placed under the paving at several locations.

Both sewer and water lines were laid in trenches excavated by six trenching machines. Trenches vary from 7 to 14 ft. deep in fine running sand. No sheeting was used, but workmen with long spuds followed close behind the machines, sloping the banks and throwing the spoil within reach of the excavators.

Until the water line from Corpus Christi was completed last September, water for construction and sanitary purposes was obtained first from the bay, and later from nearby wells. Domestic water had to be hauled in.

Buildings

The industrial buildings and hangars required 15,000 tons of structural steel in addition to 2,000 tons of hangar doors. A temporary railroad spur was run to each large building, so all steel was delivered directly to point of placement in railroad cars. Though the steel came in at the rate of 30 to 40 carloads per day, it was erected as fast as received by eight crawler cranes in about three months' time. No demurrage occurred on steel shipments.

Lumber and other materials for the barracks, schools, quarters and housing were handled by truck from central storage yards. As all buildings are heated from a central plant, construction of steam tunnels in open cut was one of the big jobs in connection with the building.

Organization

The project is being built by the U. S. Navy, Bureau of Yards and Docks, Rear Admiral Ben Moreell, chief. Commander L. N. Moeller (CEC) is officer in charge of con-

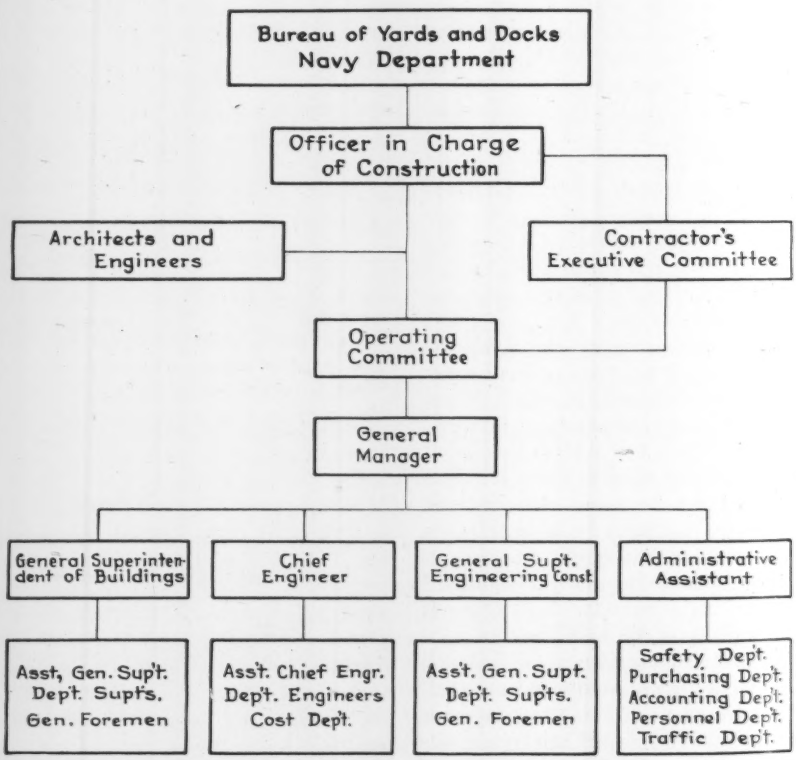

Bureau of Yards and Docks
Navy Department
Officer in Charge of Construction
Architects and Engineers
Contractor's Executive Committee
Operating Committee
General Manager
General Superintendent of Buildings
Chief Engineer
General Supt. Engineering Const
Administrative Assistant
Asst, Gen. Sup't. Dep't. Supt's. Gen. Foremen
Ass't. Chief Engr. Dep't. Engineers Cost Dep't.
Ass't. Gen. Supt. Dep't. Sup'ts. Gen. Foremen
Safety Dep't. Purchasing Dep't. Accounting Dep't. Personnel Dep't. Traffic Dep't.

Fig. 7. Project organization chart. On Navy fixed-fee contracts the Navy and contractors are partners.

Fig. 8. Typical of the fine barracks the Navy builds for enlisted men.

struction, assisted by Lt.-Comdr. A. C. Eberhard, U.S.N.R. Robert & Company, Inc., Atlanta, Ga., is engineer-architect for whom H. W. Howarth is general manager and R. E. Irvin is assistant manager. The architect-engineer organization is broken down into the following departments: architectural, structural, mechanical, electrical, municipal and personnel.

Under the terms of all navy fixed-fee construction contracts, the officer in charge of construction is a member of the contractor's executive committee, which, under terms of the contract, includes a direct representative of each firm making up the combination of contractors holding the general contract. This committee handles matters of policy, but general direction of the work is in the hands of an operating committee, of which the general manager is a member. Reporting to the general manager are the general superintendent of building, general superintendent of engineering construction, chief engineer and administrative assistant in charge of office, accounting and purchasing. A coordinator works with these four division heads. The organization chart of the project is given in Fig. 7. For the contractors, Brown & Root, Inc., W. S. Bellows, and Columbia Construction Co., W. S. Bellows is chairman of the operating committee, W. A. Woolsey is general manager, and L. M. Bush is chief engineer.

Corrosion Tests of Irons and Steels

PROTRACTED EXPOSURE TESTS of irons and steels of various characteristics to corrosive influences indicate that averaged figures are of little value and that results vary so widely that no general conclusions can be drawn as to losses of weight by corrosion. This, briefly, is the gist of the 18th annual report of the "Sea-Action Committee" of the British Institution of Civil Engineers, as reviewed in *The Engineer* (London). The tests, which were made at various ports throughout the world, were of four classes:

Sea Air Corrosion—In every case, cleaned mild-steel bars lost less in weight than similar steels having the scale left on. While scale tends to prevent further oxidation, it does so only when firmly attached. But scale is brittle, and readily cracks and flakes off. The results indicate the advantages of thoroughly cleaning the bars. With carbon steel, resistance to corrosion is increased with reduced sulphur and phosphorus content. Copper of 0.635 and 2.185 percent reduced the losses in weight, and further reduction occurred with steel having 3.75 percent nickel. Chromium steel and high-nickel steel were in almost perfect condition after 15 years' exposure, pitting being negligible.

Fresh Water Immersion — During the first five years the cleaned bars lost more weight than those uncleaned, probably through the protection of the scale. But after 15 years the scale had partly disappeared, and both sets of bars behaved alike. Also, cleaned bars of wrought iron, ingot iron and mild steel behaved much alike. Irregularity of corrosion and severe localized attack on the uncleaned bars indicate that "the best policy is to clean the metals free from scale before exposure to corrosion in fresh water."

Steels of copper, nickel and chromium content showed higher resistance to corrosion. Differences in sulphur and phosphorus did not affect the rate of corrosion as seriously as in the air exposure tests.

Sea Air and Water Exposure—With absence of shelly fauna and vegetable matter, the weight losses were mainly proportional to the period of exposure, but where thick accumulations of barnacles formed mechanical protection the loss was considerably reduced. The influence of scale and of sulphur and phosphorus was much the same as in bars subjected to sea air exposure.

Sea Water Immersion — Here the different steels behaved more alike than in air exposure. The best record was a high-nickel steel, while ingot iron and mild steel showed the poorest results. But while the cleaned bars were corroded evenly, the uncleaned bars were deeply pitted and notched, so that the advantages of cleaning were obvious. In contrast to the sea air tests, carbon steels high in sulphur and phosphorus were among the best, and a steel low in these elements was the worst.

Cast Irons—For sea air exposure and intermittent exposure to air and sea water, cast irons showed satisfactory results, but in immersion tests they were greatly inferior to wrought iron and mild steel. Except in air exposure, cast irons are said to suffer from the disadvantage that even careful mechanical scraping may fail to indicate the extent to which corrosion has penetrated. "The apparent condition of the metal may be very dangerously misleading. In all cases there is the danger that the cast iron may be weakened by blowholes or other internal irregularities."

Conclusions—In different conditions of exposure the several irons and steels show marked differences, indicating that among commercial grades no one has proved best under all conditions. However, high-nickel and chromium steels show the best records. "To strike an average for all types of exposure would give very wrong impressions. It is very important, therefore, in choosing a metal to withstand corrosion, to take into consideration the nature of the corroding influences."

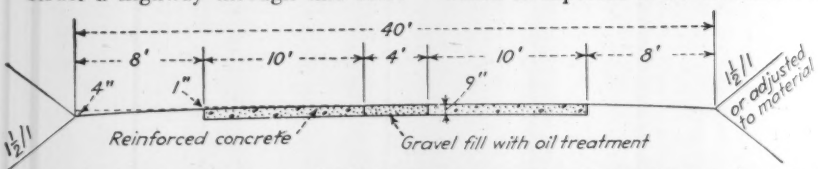
Work Pushed on New Highway Across Isthmus of Panama

***Contents in Brief**—Construction of 24½ miles of highway through the tropical jungles of Panama to connect Colon with the present highway from Panama City to Madden Dam has been undertaken as part of the work of improving the defense facilities at the Panama Canal. The road is to be a divided-lane highway paved with concrete and designed to carry modern military equipment. Construction is being carried on continuously, six days a week, on part of the work to speed its completion.*

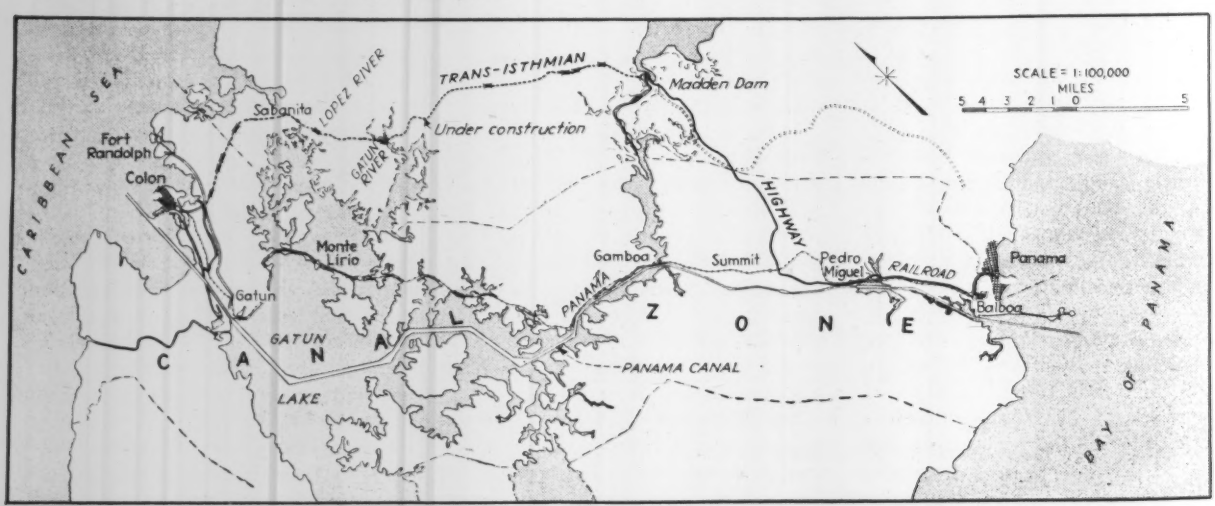
COMPLETION OF A ROAD across the Isthmus of Panama to connect the cities at the end of the Panama Canal has been undertaken by the United States government as part of the current work of improving defense facilities at the Panama Canal. The road also will be very useful to the Republic of Panama, through which most of the new construction lies, as it provides the first highway between the two principal cities of the Republic, Panama and Colon. Part of the work is being carried forward continuously in order to complete the road before the rainy season next spring.

Construction of a road across the isthmus never was undertaken before, due partly to the many difficulties involved, partly to fear of taking business away from the Panama R.R., and in part through fear that such a highway might make enemy military operations in the Canal Zone easier. But demand for a highway between the ends of the canal has increased in recent years and as a result, in the treaty between the United States and the Republic of Panama proclaimed in 1939, the United States agreed to provide a corridor from the Panamanian city of Colon, formerly entirely surrounded by the Canal Zone, to the boundary of the zone, and to construct a highway through this corridor. The Republic of Panama, in return, agreed to provide a right-of-way for a highway from Colon to Madden Dam. A highway from Madden Dam down to the city of Panama was built about ten years ago in advance of construction of the dam. It is of concrete, about 25 miles long.

Location surveys for the new road were started from three points in October, 1940, and were completed in April of this year. As located, the road is 24½ miles long. Its maximum ascending grade toward the Pacific will be 5 percent, and toward the Atlantic will be 7 percent for grades not more than 400 ft. long and 6 percent on longer grades. The minimum radius of curvature will be 573 ft. and the minimum sight distance 600 ft. Excavation required is estimated at over 3,000,000 cu.yd., most of which is expected to be common ex-



The new highway is to be a divided-lane road paved with reinforced concrete to permit its use for trucking and for military equipment at all seasons of the year.



The new highway to connect the cities at the ends of the Panama Canal is being built largely outside of the Canal Zone. It extends from the end of the modern highway to Madden Dam westward past the upper end of Gatun Lake to a connection with the Fort Randolph highway near Colon.

cavation, although considerable ledge rock has been uncovered at the Madden Dam end of the line, and more is expected in the deeper cuts. Some of the heavier cuts will be 100 ft. in depth, and fills will be correspondingly high.

Extensive soil tests were conducted by the engineers of the Public Roads Administration. These studies are being used in determining the maximum permissible height of fills and the safe angle of slope for both cuts and fill.

Because of the heavy rainfall in Panama, more and larger drainage structures are required on this route than on routes of similar length in the United States. The average annual rainfall in Panama is about 100 in., most of which falls from May to December, the rainy season.

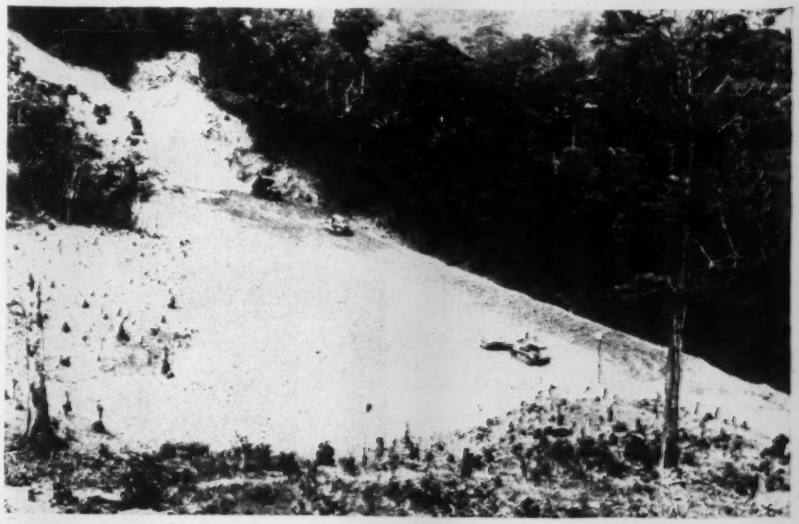
In addition to the numerous culverts, six large and six small bridges will be required. The largest bridge, that over the Gatun River, will be 330 ft. long. Each of the major structures will have three spans, with continuous steel girders. Decks will be of reinforced concrete, and the roadway width 26 ft. between curbs. Railings will be of structural steel. To avoid delays due to floods in the rivers, the bridges are designed for erection without the use of falsework.

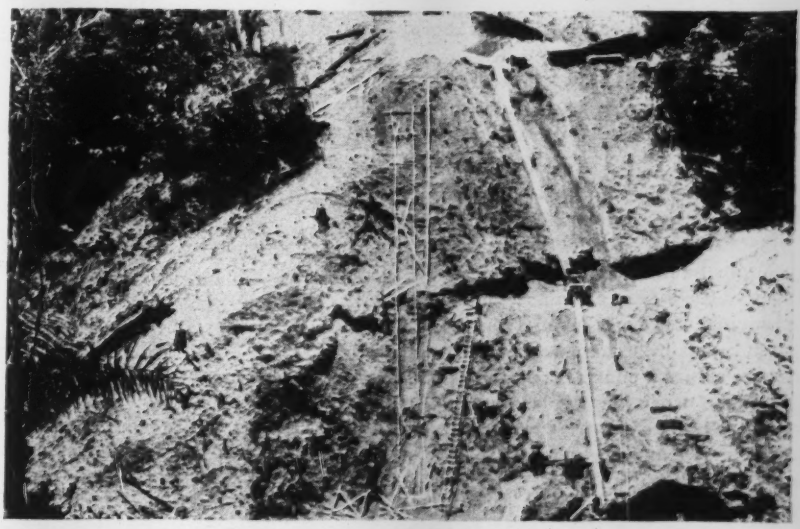
A roadway width of 40 ft. is to be provided on the highway, two 10-ft. lanes of reinforced concrete separated by a 4-ft. strip of oil-treated gravel. Shoulders will be 8 ft. wide. The roadway is designed for the H-15 loading of the American Association of State Highway Officials, and the S-12 loading is used throughout in the design of bridges and culverts. Structures designed for this loading are capable of carrying 55-ton tanks.

The estimated cost of the 24½ miles is about $4,000,000, most of the money coming from army and navy defense appropriations.

Construction operations

At the present time grading operations are in progress westerly from Madden Dam, from Lopez River southeastward to Gatun River, and in both directions from the latter river near the site of the bridge crossing. Construction of concrete box culverts is being carried on in advance of the grading, and clearing and grubbing is proceeding at various points along the line. All clearing and grubbing is being done by native machete men





The country through which the new highway is being built is very rugged and covered with dense tropical growth. The upper picture shows grading work in progress near the Lopez River, the second picture is of a 70-ft. fill under construction, and the lower picture shows concrete culvert construction.

and four "treedozers" are being used in removing large trees from the right-of-way after they have been felled.

Nearly 1,000 men are employed on the engineering and construction work. They are housed in camps at Sabanita, Gatun River and Madden Dam. Electric lights have been installed at some points so that the work can go forward on a 24-hour basis, six days a week. On the grading, twenty-seven 12-yd. tractor-scraper units are being used together with three 1½-yd. power shovels and two ¾-yd. draglines. Also, 15 bulldozers are used for the pioneer road construction and in opening the large cuts. Part of the excavation is of such a nature that its movement by bulldozers is very economical.

Most of the heavy-duty equipment —shovels, tractors and scrapers— was unloaded at Monte Lirio on the Panama R.R. and carried by barge 11 miles to the point where the highway crosses the Gatun River.

Operators for the heavy power equipment have been brought from the United States because of the need for men skilled in the use of this type of equipment. Considerable delay developed in getting these men to the work due to the scarcity of space on the ships.

Panamanian laborers are given every opportunity for employment in all positions for which they can qualify and are used extensively in clearing and grubbing and other construction operations. Panamanian instrumentmen, chainmen, rodmen and machete men are employed in the engineering parties.

Sand and gravel is being dredged from the Gatun River about one mile from the point where the highway will cross the river. Two 8-in. sand and gravel pumps mounted on barges pump the dredged material 600 ft. to a plant where it is loaded into 6-yd. trucks for hauling to a batching plant at the Gatun River crossing. Cement for paving will be shipped from the United States in a chartered vessel in order to assure a constant supply.

Concrete work on the culverts is under way and construction of the pavement is expected to begin in the near future.

All engineering and construction work is being carried on by the Public Roads Administration under an agreement with Panama, construction being by force account.

Strain in Steel Tower Legs Measures Cement Silo Content

MICROMETER READINGS on the deformation of structural steel tower legs supporting cement silos at Shasta Dam are used to indicate the weight (and consequently quantity) of cement in storage. Following a plan put into effect by the U. S. Bureau of Reclamation at Grand Coulee Dam, on the Shasta cement storage silos the upper ends of 16-ft. steel rods are bolted to the main tower legs under each silo with the lower ends of the rods near enough to a bracket so that the separation can be measured by a standard micrometer gage. Thus deformation under stress in the 16-ft. length of steel tower leg can be measured accurately. Having once calibrated the readings for different amounts of cement in the silo, it is possible to determine approximate cement content when the micrometer gage reading is known. Rods are mounted on all four legs of each silo to get average readings as the silos fill unevenly.

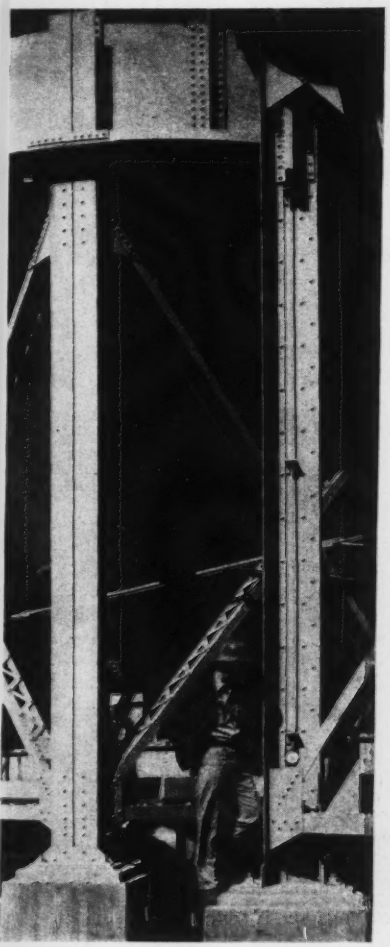


Fig. 1. The lower end of the 16-ft. rod comes close to a bracket also attached to the tower.

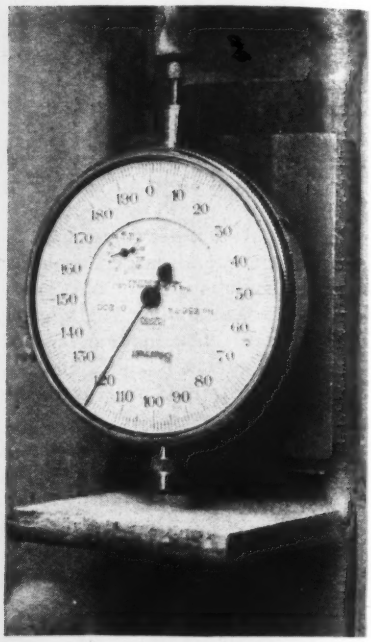


Fig. 2. A micrometer gage measures the varying distance between rod end and bracket.

Readings at night

To eliminate the temperature factor introduced by the sun's rays warming the steel, readings are taken at night. The method has been found quite accurate except when the silos are nearly empty or nearly full. In other words, for silo loads from 200,000 lb. to 2,000,000 lb., the readings are reliable.

There is a record of cement weight, of course, in the bulk carload shipping tags and cement is weighed in the mixing plant on the dam, thus constituting two accurate measurements of cement weight independent of the silo gages. The silo strain measurements are useful chiefly in a monthly check of inventory of the cement in storage and for such purpose exact figures are not needed.

Notes on the Waterworks Meeting

DISCUSSIONS bearing on waterworks preparedness for national defense dominated the technical sessions of the 61st annual meeting of the American Water Works Association held in Toronto, Ont., Canada, June 22–26. But also claiming attention were a number of papers dealing with operation, maintenance and management matters. And particularly spirited was the reception accorded to the initial report on revision of U. S. Standards for Drinking Water Quality.

In the following pages are included abstracts from some of the reports and discussions which were listed on the program. The papers used for this purpose were selected on the basis of probable greatest general interest to thousands of readers of *Engineering News-Record*. A complete news account of the convention with the names of new officers, registration data, and recipients of awards, was published in the July 3 issue of *ENR*, page 5.

EMERGENCY MEASURES

Civilian Protection

In these very serious times it is most desirable that every citizen should have some knowledge of protection for meeting the effects of hostile enemy action. To this end there has been organized in Canada a civilian defense committee modeled after the Air Raid Precaution (ARP) organization established in Great Britain. Formation of this committee is not directly related to imminence of air attack or invasion, but it results from the fact that attack, either from within or without, is a risk which cannot be ignored.

Province-wide advisory committees are established throughout the Dominion to create a volunteer civilian organization to meet emergencies occasioned by war, to protect life and property, to assist the civil powers by cooperating with all police and other law enforcement agencies, to combat subversive activities, to assist in fighting fires resulting from sabotage or other acts of war, to instruct the civilian population in emergency services and cooperate with and assist all federal and provincial authorities in the performance of duties relative to the objects of this organization.—NORMAN J. HOWARD, *director of water purification, Toronto, Ont.*

Defense Precautions

With $1,388,000,000 of national defense contracts (the most for any one state) being carried out in New Jersey, the importance of having that state's water supply systems geared to meet new demands and protection of those systems is emphasized.

The New Jersey Defense Council, which was created by the governor in October, 1940, and sanctioned by the state legislature December 21, 1940, made a survey to determine what steps against sabotage had been taken by water purveyors. Many worthwhile measures had been taken, including: Erecting signs at water supply dams warning airplanes to stay away from those areas; establishing emergency crews in three 8-hr. shifts with fully equipped trucks and short-wave radio (tuned to the municipality's police station) to handle all leaks, breaks, and similar trouble requiring immediate attention; installing stop planks below reservoir dam outlet gates to back up water so as to flood the gates, thus preventing interference with the outlets; painting fire hydrant tops with phosphorescent paint as an aid during "blackouts"; enclosing pumping and filtration plants with high wire fences; and fingerprinting of waterworks employees. — H. T. CRITCHLOW, *engineer in charge, New Jersey State Water Policy Commission, Trenton, N. J.*

Emergency Chlorinator

Some years ago the San Francisco Water Department built a $2,500 portable chlorinating machine for general and emergency use. This equipment comprises a 300-lb.-capacity vacuum chlorinator mounted on a four-wheel trailer, together with a gasoline-engine-driven water pump and two 150-lb. chlorine cylinders. The chlorinating unit is of the high-pressure type, manually operated, and is equipped with various sizes of injector throats and manometer tubes to feed chlorine dosages varying from 10 to 300 lb. per day. The chlorinator's water supply is provided by a 3-cylinder reciprocating pump delivering water up to 300-lb. discharge pressure. The proper water pressure for the injector is obtained by increasing or decreasing the speed of the gasoline engine, which is connected to the pump by means of multiple V-belts operating on pulleys.

The unit is also equipped with a water pressure intake, bypassing the pump, so that the chlorinator may be operated without the pump if a high-pressure water supply is available. The pump intake is a standard 2-in. pipe equipped with accessories to take all sizes of standard pipe and fire hose so that suction may be obtained from a fire hydrant or other convenient outlet. Suction may also be taken from an open conduit, ditch, or reservoir. Discharge is by means of 200-ft. steel-wrapped rubber hose equipped with standard silver solution tube and standard pipe fittings, which makes possible discharge into any convenient outlet or a fire hydrant.—G. E. ARNOLD, *chief water purification engineer, San Francisco Water Department.*

Chlorination Equipment

Standard chlorinating apparatus can readily be transported in emergencies to various points as needed. Chlorinator manufacturers are best able to designate the type of equipment most suitable for particular uses, and of two American producers one has already available on individual orders a considerable number of mobile units using standard vacuum chlorinators.

A stock model portable chlorinator, suitable for either direct or solution feed, which is especially applicable

for main sterilization, is also available. The standard meter and orifice provided has a capacity of 40 lb. of chlorine per 24 hr. This outfit is mounted in two compact cabinets, and is adaptable to a variety of uses. In addition, a new mobile trailer unit has been designed, completely equipped with a chlorinator, two cylinders of chlorine, and pump.

A large number of small pumps are available to feed hypochlorite solutions for disinfection. These units generally utilize power from an electric motor, from a water meter, or may be directly connected to a pump drive shaft. They are suited for continuous emergency, or special chlorinating purposes and may be either manually controlled, operate automatically at a fixed dose, or provide a dose directly proportioned to water flow. For temporary use under emergency conditions any dry-feed machine may be used to feed dry hypochlorites into a solution box, and the solution may be discharged by gravity or pumped to the required point of application—H. A. FABER, *sanitary chemist, The Chlorine Institute, Inc., New York.*

Radio Communication

In the present unlimited national emergency impetus is given to the use of radio systems for waterworks. This form of communication comes under the Federal Communication Commission's general classification of "Emergency Radio Service." Use of radio by waterworks groups is strictly limited to emergencies or to communications where telephone facilities do not exist. Since over 1,100 municipal police radio stations are now licensed, water departments in most large and medium-sized cities could avail themselves of this service, since the additional load on the stations is small. Little expenditure other than purchase of a few mobile receiving sets for water department emergency trucks would be required.

Where a water department requires its own radio the ideal set-up is a transmitter-receiver at the waterworks office and outlying plants, and mobile transmitter-receivers on maintenance trucks. The best frequency choice for waterworks radio transmission is between the medium and ultra-high frequency bands. The two types of equipment available are amplitude-modulated and frequency-modulated systems. The latter offers many advantages in the high-frequency wavelengths, including greater range.

A cost estimate for frequency-modulated equipment of ultra-high frequency is: 250-watt station transmitter (necessary only for very large systems), $2,000; 25-watt station transmitter, $325; 25-watt mobile transmitter, $275; station or mobile transmitters, $200; ½-wave station antenna, $75; and ¼-wave mobile antenna, $15.—W. VICTOR WEIR, *superintendent St. Louis County Water Co., St. Louis, Mo.*

DRINKING WATER STANDARDS

Suggested Modifications

A first draft of suggested modifications of the U. S. Standards for Drinking Water Quality has been prepared by the subcommittee and transmitted to the full committee membership for review and comment. Some of the changes in statement of the standards that are under consideration are as follows:

Improvements in bacteriological technique, particularly for determination of the coliform group and the interpretation of the results have indicated the advisability of modifying the statement of the bacterial part of the standard to conform more nearly with accepted practices. No material increase in the stringency of the standard is contemplated, but certain features of the bacteriological requirements are under consideration. One of these concerns the examination of larger portions than the 10-milliliter size now specified. Where the coliform density is approximately one per 100 milliliter of sample (the upper limit permitted by the present standard), it can be shown readily that the examination of 10-ml. portions does not permit the detection of the coliform group by the dilution method in this range. By increasing the size of portion examined (to 100 ml.) this difficulty is overcome and the result may indicate an approach to the limiting value permitted by the standard and consequently permit the inauguration of remedial measures before the permissible bacterial limit is exceeded.

To avoid the occurrence of periodic breaks in the bacterial quality of approved supplies (which lapses now are possible because results are averaged over long periods) it is suggested that the period for averages be limited to one month. In other words, that for approval, any water supply involved should meet both requirements of the standard during any one month. However, when a result is indicative of significant pollution, it is suggested that at least daily samples be examined until satisfactory bacterial quality is again attained.

Due attention should be given to the water quality as delivered to the consumer, and it is proposed, therefore, that a specified minimum number of samples receive routine examination from various points in the distribution system, this number to be governed by the average daily volume of water delivered.

Some changes have been suggested in that part of the standard concerned with "physical and chemical characteristics" in accordance with new facts that have been developed since 1925. These modifications relate to certain toxic metals and their salts which may occur in water and to other objectionable substances in waters used for drinking and culinary purposes. Among the objectionable metals being considered for the first time are boron, selenium, and fluoride. The present allowable limits of copper and of zinc might well be raised, and the same is true of caustic alkalinity and of the carbonates of sodium and potassium in over-treated waters.—J. K. HOSKINS, *senior sanitary engineer, U. S. Public Health Service, Washington, D. C.*

DISCUSSION—Two reasons are given for the proposed revision: (1) because many improvements in water supply practice have been adopted since 1925 with increased uniformity of quality and safety; and (2) because it is in order for the standards to conform more closely to current requirements for water supplies of attainable safety and potability. After studying the proposed revisions, the writer reaches these conclusions:

Records of plant performance and of public health furnish no evidence to support

any increase in the stringency of the existing bacteriological standards.

Most water purification plants can comply with the existing bacteriological standard on the basis of plant effluent samples, but many plants will fail at times on the basis of distribution system samples. If distribution samples are to be considered in a revised standard, compensating factors should be allowed based on the characteristics of the individual supply.

There appears to be no reason for the adoption of a larger standard sample.

A revised standard should give definite recommendations as to frequency of sampling and testing on a basis of size of plant, previous record and quality of raw water.

A revised standard should take account of cross-connections and interconnections.

If possible, a revised standard should be based upon the results of scientific research rather than upon empirical considerations.

The section on chemical requirements is in need of revision and modernization.—GEORGE D. NORCOM, *sanitary engineer, New York Water Service Corp.*

DISCUSSION—The proposed revisions of the standards are good and are in the right direction, but they are not extensive enough to accomplish all that should be done. Much of the opposition from water purification plant operators to extensive revision likely would be of the nature that they prefer to have a standard so low they need never worry about the possibility of not meeting the suggested requirements. If the requirements are set with this in view, then the writer urges the operators of water purification plants to set their own aim of quality and almost forget about the U. S. Public Health Service and state health department standards as guides to efficient operation.

The minor revisions which have been recommended are encouraging, but likely will accomplish very little in giving additional safeguard to health. Much more could be accomplished by giving us a good aim of performance in the bacteriological quality of water, and being still more specific in defining adequate water systems, capable personnel, and good operating performance. This would produce no unjust burden upon anyone or any treatment plant.—JOHN R. BAYLIS, *physical chemist, Bureau of Engineering, Chicago, Ill.*

PURIFICATION AND OPERATION

Amebic Dysentery Studies

Amebic dysentery may be transmitted through water by the cysts of the protozoon *Endameba histolytica.* Although commonly thought of as a tropical disease, from five to ten percent of the United States general population are believed to be carriers of amebic cysts. What makes amebic dysentery an important hazard in water supply and deserving of continuing study by sanitary engineers is the chance of its spread by: (1) sporadic, localized dissemination of cysts through back-flow in plumbing systems and distribution cross-connections; (2) invasion of water supply sources in the absence of adequate general sanitation; (3) increased carrier rates associated with unhygienic practices and surroundings; (4) use of heavily polluted water under conditions of military exigency; and (5) sewage pollution of water distribution systems that may accompany destructive burning and bombing of communities.

Certain general conclusions may be drawn concerning the results so far obtained in an experimental study of the length of survival of the cysts of *E. histolytica* in water at different temperatures and the reaction of the cysts to chlorination under varying conditions. A general conclusion, within the limits of the experimental work already carried out, is that the viability of the cysts is shown to be largely independent of water quality but greatly affected by water temperature. A survival for about 90 days at freezing temperature is reduced to 30, 10 and 3 days at 50, 68 and 86 deg. F. respectively.

Likewise the concentration of gaseous chlorine needed to destroy the cysts of *E. histolytica* appears to lie well within the range of practicable superchlorination, provided the contact period can be extended to 30 min. or longer. Chlorine dosage and residuals are shown to be functions of water temperature, contact time, cyst density, and hydrogen-ion concentration. Cysticidal chlorine requirements appear to be affected approximately as follows: (1) they are cut in half by a rise in water temperature of 20 deg. F.; (2) they are decreased by about 25 percent when the contact time is doubled; (3) they are increased by about 25 percent when the density of the cysts is doubled; and (4) they are cut in half when the pH value is lowered from 7 to 6, and increased by about 25 percent when raised to 9.—S. L. CHANG *and* GORDON M. FAIR, *Harvard School of Public Health and Harvard Graduate School of Engineering, Cambridge, Mass.*

Cathodic Protection

Cathodic protection as a method of preventing the corrosion of pipelines was suggested by Clement and Walker in a publication of the U. S. Bureau of Mines in 1913, but little use of the method was made until it was tried on the gas transmission lines by the New Orleans Public Service, Inc., in 1930. In seeking statistics as to the extent of cathodic water tank installations at the present time reports provided by two installing companies showed that total installations numbered 1,002. However, the figures for this year were considered to represent orders rather than installations, and thus the actual number of new tanks having this protective device would appear to be in the neighborhood of 800.

Operating experiences of companies providing equipment are dissimilar. One expresses a preference for a special type steel for anodes as compared with graphite or carbon, while another states "The disintegration of one pound of graphite would require 4,053 ampere-hours compared with 790 for stainless steel. (These figures indicate a probable effective life for carbon to be over 5 times as great as stainless steel.)" A third organization advises that, "We have found through much experience that there is no better material than pure low-carbon steel, free from impurities." One company has gone progressively from mild to stainless steel, then carbon, and is now utilizing cylindrical containers of varying diameter and length made from spun glass cloth filled with coke breeze.—J. CLARK KEITH, *general manager, Windsor Utilities Commission, Windsor, Ont., Canada.*

Cement Lining—New Mains

Within the past four years the city of Toledo, Ohio, has used centrifugally applied cement lining to 26,700 ft. of newly laid distribution mains, generally of 48-in. and 60-in. diameter. To prepare the inner surface of the 48-in. pipe for mortar, the surface was wire-brushed. Next, rags were used to wipe the interior surface dry

of all free moisture. Then the space between the pipe ends on the inside was hand-filled with cement mortar and smoothed with a trowel to present a continuous even surface. While this work was being done, all branches and openings of 10-in. diameter and under were filled with rags or in some other manner closed off to present a continuous surface. Larger openings were not closed, since it was found better to stop the lining machine and apply the lining at those points by hand.

The lining, varying in thickness from $\frac{3}{16}$ to $\frac{1}{4}$ in., was applied by a standard type machine. After 8 months of service the 48-in. line was drained and opened for inspection, which showed the lining to be tight and sound throughout. A check on flow characteristics of a relatively straight 9,035-ft. section gave an average value of C equal to 141.

Pipe cleaning and lining operations for the 60-in. main, which was 11,270 ft. long, followed in all essential details operations for the smaller line. The large line has not been drained and opened for inspection, neither has the pipe been tested to determine the C coefficient. Lining for the 48-in. line was done by a general contractor and cost $2.79 per ft. Lining of the larger main, also by contract, cost $2.50 per ft.—GEORGE N. SCHOONMAKER, *city manager, Toledo, Ohio.*

Cement Lining—Old Mains

Cement lining of 20,000 ft. o 36-in. and 14,000 ft. of 48-in. force mains in place was carried out last year by the city of Akron, Ohio, at a cost of $2.50 per ft. The 36-in. line, laid in 1913–1914, was made from soft open-hearth steel plates. The 58-in. line, built a few years later, consisted of 4,650 ft. of cast-iron pipe and 9,350 ft. of steel pipe. By Jan. 1, 1940, 480 repairs had been necessary on the 36-in. main, more than half of which were concentrated on a 4,650-ft. section. Repairs on the 48-in. pipe totaled 40.

In preparing the pipe for the lining, all leaks were repaired by welding a 4x4x$\frac{1}{4}$-in. plate over the hole, either inside or outside, as conditions warranted. General cleaning process was to cut out a 7-ft. section adjacent to a line valve controlling the length of pipe to be cleaned. Then the cleaning machine was introduced, the pipe section replaced, and at the far end of the line another 7-ft. section was removed to permit discharge of cleaning water and, later, removal of the cleaning machine. The machine was driven along by water pressure obtained by opening the control valve. A speed of 200 ft. per min. proved very satisfactory and two trips of the machine removed about 80 per cent of the coating and the small amount of tuberculation present. The cleaning job was finished with hand scrapers.

The mortar, a 1-to-1 mix of portland cement and dry-screened sand passing a No. 16 screen, was of such consistency as to provide a dense, homogeneous lining. The water-cement ratio was carefully controlled and kept to an absolute minimum. The lining, $\frac{1}{4}$ to $\frac{1}{2}$ in. thick, was placed by a standard lining machine. For a $\frac{1}{4}$-in. lining the rate of travel of the machine along the pipe was 3 ft. per min.—W. R. LADUE, *superintendent and engineer, bureau of water supply, Akron, Ohio.*

Regional Water Supply

Changing concentration of the urban population in the United States, as evidenced by the 1940 census, shows a decided halt in rapid growth of cities. Many cities show decreases in population, or comparatively insignificant gains in the last decade. On the other hand, there has been a large increase in the growth of suburban areas on the fringes of cities. This expansion of practicable living area brings with it the demand for wider service areas and the extension of costly utilities. Among the latter is water supply.

There is traditional opposition to the extension of municipal services to unincorporated areas of a city. Such extensions involve problems of political structure, legal powers and financial arrangements. But the fact is that now, more than ever before, we must adopt a realistic view of the situation and face these problems. Formulas must be found which involve new forms of group relationship; financial relationships must be worked out for the satisfactory partition of costs among beneficiaries; and there should be an evaluation of principles and methods for dealing with the needs and conveniences of those who live in areas beyond a city's boundary lines. This is the challenge which must be met by municipal water authorities and other service agencies.—ABEL WOLMAN, *professor of sanitary engineering, The Johns Hopkins University, Baltimore, Md.*

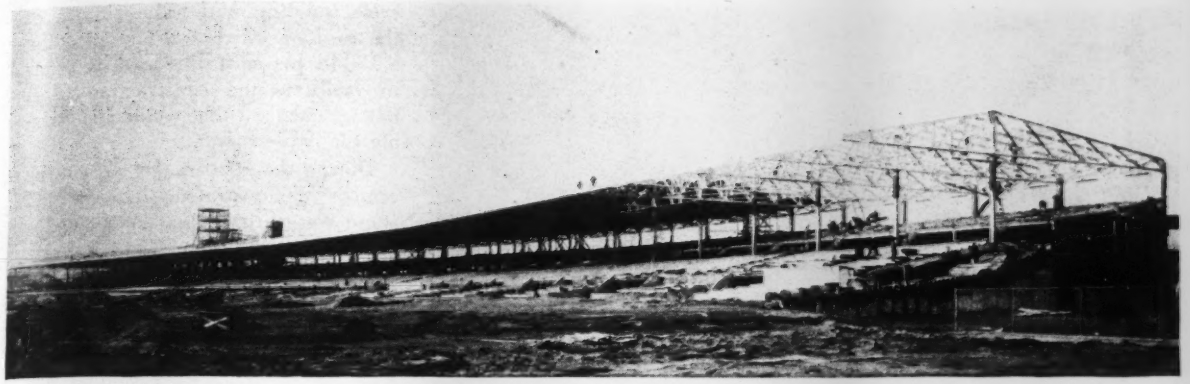
ADMINISTRATION AND ACCOUNTING

Canadian Water Rates

Now in operation in Canada are some 1,300 public or municipal waterworks systems. Many of these are quite small and the systems are almost exclusively publicly owned. Actual supervision and administration comes generally under either a utilities commission or municipal council committee. Charges for domestic water supplies in Canada are divided into two groups, flat rates and metered rates. Of the plants surveyed 61 percent had less than half of the residential services metered.

A review of the methods used in Canada for adjustment of flat-rate water charges makes it apparent that there is no close uniformity of methods as between municipalities, and as between the different services supplied. The fact that the trend is toward metering is a further indication of this defect. With those municipalities where metered water rates are in force the situation is quite different. More equitable charges are to be found and provision is made for renting the meter either as a separate charge or included in the water bill as part of the minimum charge. In those cities where domestic supplies are almost entirely metered there appears a fairly even division between practice of making a special meter-rental and that of including it in a minimum charge. Sliding rates are in general use, but there is a complete lack of uniformity concerning division lines of the scale.

Average cost of Canadian waterworks systems has been computed to be $4.83 per capita per year with debit charge amounting to 44 percent. Charges for water supplies have generally been between 8 and 15 cents with the average for a selected group 13.75 cents per 1,000 gallons.—A. E. BERRY, *Ontario Department of Health, Toronto, and* WM. STORRIE, *Gore & Storrie, Consulting Engineers, Toronto.*



At Jamaica 2,000 tons of steel were erected in a month to complete this grandstand for the 1941 season.

Two Designs for Racetrack Grandstands

Henry Eipel and William Eipel

Structural Engineers, New York

***Contents in Brief**—Additions to the horse racing plants at Jamaica and Aqueduct, Long Island, include large-capacity grandstands — one of reinforced-concrete design and the other of structural steel—which illustrate current design for this type of structure.*

TWO TYPES of grandstand design were used in recent additions made to the facilities at the Jamaica and Aqueduct horse racing tracks on Long Island, New York, as a result of the increase in attendance following the legalization of pari-mutuel betting in New York State. A framing of reinforced concrete, including steps and risers, was used for the grandstand during the remodeling of the Aqueduct racing plant, with the seats fastened directly to the concrete riser beams. The corresponding design at the Jamaica stand was in steel with concrete slabs used only on the steps of the grandstand, and with the seats bolted directly to the I-beam risers. In both structures the cantilever roof trusses are of steel and support a judges' stand at the forward edge requiring a special anchorage design at the back wall.

Concrete at Aqueduct

Prior to the opening the 1940 racing season at the Aqueduct track, the old paddock, administration building and the clubhouse section for the old wooden grandstand were replaced to provide a more modern structure seating approximately 3,000. The clubhouse grandstand was also built to include a glass-inclosed dining room located so that all diners on the successive terraces had an unobstructed view of the entire track.

This new main grandstand is framed in reinforced-concrete, as indicated in the accompanying drawing. A carefully controlled mix providing a minimum strength of 3,500 lb. per sq.in. was used. A water-cement ratio of 6 gal. per sack of cement was specified with a cement content of at least 6¼ sacks per cu.yd. To establish the proportioning of aggregate for the controlled concrete, four specimens were made up with the fixed water-cement ratio of 6 gal. per sack, and varying amounts of fine and coarse aggregates, using a minimum cement content of 6¼ sacks. From a curve showing the 28-day strength relationships of these four types of specimens, an aggregate relationship between fine and coarse was selected.

During the course of construction, representative samples were taken for every 100 cu.yd. of concrete placed, and these samples were separated into their component parts of water, cement, fine and coarse aggregate. These were compared with the values established by the preliminary tests, any variations were corrected, and new proportions established if the characteristics of the aggregates had changed materially. In addition, during each daily pour, at least two test cylinders were made and stored, and 7 and 28-day tests made. By this procedure a high-strength concrete was obtained with a durable finish and highly weatherproof characteristics. By using the New York City Building Code allowable stresses of $.4f'c$ for fiber stress in compression and $.02f'c$ for beam shear without web reinforcement and no special anchorage, for this grade of concrete, the depth of all beams and girders was kept to a minimum.

Girders and supporting columns were spaced at 14-ft. intervals. These girders are 12 in. wide and have a minimum depth of 18 in.; they are supported on Lally columns in the betting ring area. The risers supporting the seats were designed as beams spaced 3 ft. on centers and spanning the 14 ft. between the girders. The 3-ft. width of steps was poured as a 4-in. slab, reinforced between the riser beams. All girders, riser beams and slabs are monolithic.

Expansion joints in this stand were spaced every 56 ft., and at these points double beams and columns were provided. The expansion joint consisted of a 16-oz. copper dam with a fiber filler.

Steel framing ready for the concrete steps at the Jamaica stand. Note the spacer bolts between beams. The steps are 2½-in. slab with wire mesh reinforcing.

The supporting system for this stand consisted of spread footings on sand. These footings were of regular 1–5½ mix of concrete, and all the other concrete in the structure was the controlled concrete previously described.

Over this concrete grandstand, a roof of steel trusses supported on steel columns was erected. The covering consisted of wood rafters, sheathing and a built-up roofing. This roof has a 41-ft. overhang (see drawing) and the trusses are spaced at 28-ft. intervals. Purlins and crossframes were framed into the truss panel points and the wood rafters were supported on these. The steel columns were anchored to the concrete columns at the stand level.

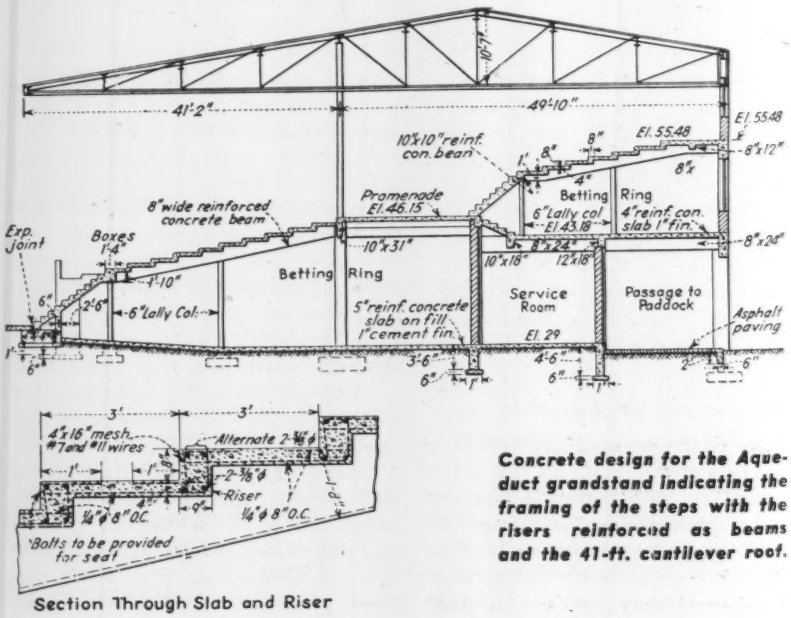
On the forward edge of this cantilever roof a two-story judges' stand is located, which necessitated the anchoring of the trusses against uplift along the rear wall. This anchorage consists of four 1-in. round bars extending from the base of the steel columns at the high stand elevation directly down to the footings. These rods were welded to the column base which in turn was welded to the steel columns supporting the trusses. The typical trusses supporting only the roof were anchored to the concrete columns with four 1-in. round rods 4 ft. long.

Steel at Jamaica

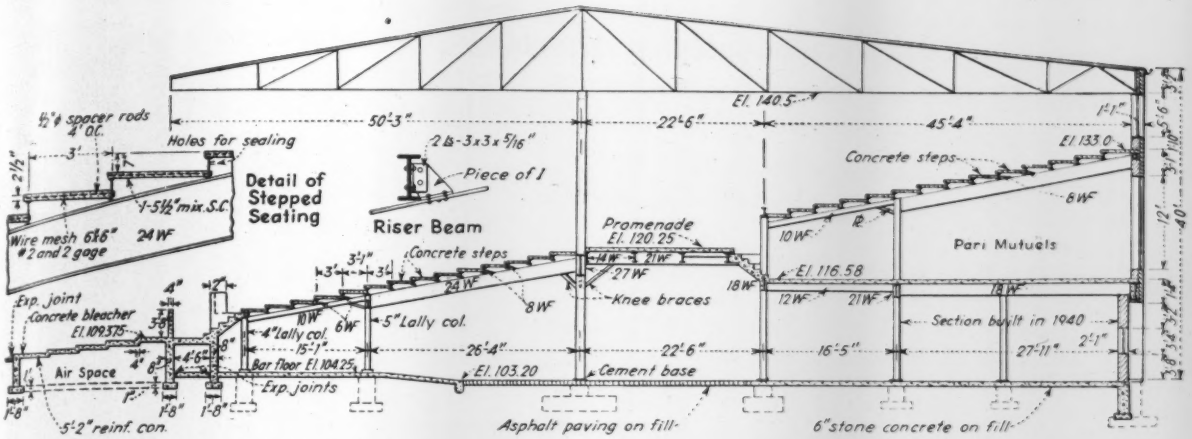
While the work at the Aqueduct track was under way, during the winter of 1939–1940, the facilities at Jamaica were also being remodeled for the pari-mutuels. This work consisted of adding a new steel and concrete building under the old stand, the roof of which was designed for a 100-lb. per sq.ft. live load, in order to facilitate the construction of a new grandstand that would incorporate the two structures.

During the 1940 racing season the crowds demonstrated that the old stand was entirely inadequate and a complete rebuilding was ordered. Plans called for the razing of all the old stands and their rebuilding in either steel or concrete. Because of the limited time and the winter construction season, a steel framing with concrete treads was selected for the Jamaica stands. This design, which is illustrated in the accompanying cross-section, included steel columns, girders and risers; with poured slabs for the treads.

An interesting detail was provided in the design of the steps which consisted of 8-in. deep beams spaced at 3-ft. intervals on the 24-in. girders. These riser beams were attached to the girders by a bolted connection consisting of a section of cut I-beam and two angles (see detail). At 4-ft. intervals ½-in. round spacer rods were connected horizontally between the upper flange of one riser and the web of the next higher riser. These spacer rods were tightened at the upper end by a thread and double-nut assembly to insure the 3-ft. spacing between the risers and also for lateral stability and correct alignment of the risers themselves. A 6 x 6-in. wire mesh reinforcing of #2 gage wire completed the supporting system for the 2½-in.



Concrete design for the Aqueduct grandstand indicating the framing of the steps with the risers reinforced as beams and the 41-ft. cantilever roof.



Steel design for the Jamaica grandstand showing the detail of riser beam connection and concrete steps. Seats were bolted directly to the riser beams. The stand has a capacity of 45,000, including 15,000 seats.

slab thickness of the steps. Shop-punched holes through the webs of the risers permitted the seats to be bolted directly to the steel members.

All secondary supporting members under the stand which were in the betting ring area are Lally columns, to reduce obstructions to a minimum and for architectural appearance. The entire betting ring floors and also the area in front of the stand were covered with an asphaltic paving of broken stone laid cold and rolled with a heavy roller. The bleachers extending beyond the stand were framed in reinforced-concrete as indicated in the drawing. The entire stand was supported on spread footings resting on sand.

The new roof consisted of steel trusses at 30-ft. spacing carrying a 51-ft. overhang. As in the case of the other track the judges' stand was built on the cantilever end of the roof trusses, which, in this case, provided no difficulties as the steel columns were anchored directly to the footings which were poured 5 ft. thick to take care of the uplift.

The purlins spanning between roof trusses consisted of 16-in. WF rolled sections, framing into these at 6-ft. centers were 8-in. sub-rafters. These, in turn, supported the 2-in. precast concrete planks that were fastened to each sub-rafter with four clips.

The trusses are tied together by a system of cross frames at every other truss panel point; these frames connect to the top and bottom chords of the trusses. In the bottom chord plane of the roof a simple system of horizontal bracing angles was used. Expansion joints on this all-steel grandstand, which is some 1,000 ft. long, were spaced at approximately 180 ft.

This stand has a capacity of 45,000, including 15,000 seats, and the cost was about $1,100,000. About 1,900 tons of structural steel were used and about 9,000 cu.yd. of concrete. On April 12, 1941, the Jamaica track opened with the largest crowd in its history and the stand was called upon to handle a crowd estimated at about 40,000.

While this work at Jamaica was being carried on, about 600 ft. of this type of steel stand was added at the Aqueduct track.

Direction

The architect in charge of the design for both new stands was Aymar Embury II. The authors carried out the structural design for both stands, being associated with T. C. Tuck. Contract for construction of Aqueduct was carried out by Kenny & Finnerty, and the contract at Jamaica was held by Roberts Nash Construction Co.

Three-Purpose Waterworks Accounts

THE AIM OF ACCOUNTING with the Denver, Colo., water department is to supply financial data in such a manner that it can be utilized effectively as a guide in managing, also as a means of determining the efficiency of employees, and as a basis of informing all interested parties of the department's financial condition and operation, according to George F. Hughes, manager of board of water commissioners, city and county of Denver, who spoke at the annual meeting of American Water Works Association recently held at Toronto, Ont. A detailed annual budget is issued at the year's end, which shows anticipated revenues and expenditures. Monthly itemized statements giving the budget's status are distributed to division heads, and thus at a glance they can tell if they are over or under their budget allowance. Since the statement gives separate figures on operation, maintenance, capital outlay, equipment, and unusual maintenance items, it is a watch-dog of expenditures.

In addition to an annual budget and a yearly report giving operation details, there is a five-year budget with a twofold aim, namely: (1) to inform water board members of necessary additions and plant improvements; and (2) to forestall a possible request from citizen groups to secure rate reductions.

The collection division follows the punch-card method for customers' bills with quarterly periods used on a monthly staggered basis and accounts due and payable in advance. Less than one-half of one percent of the customers are delinquent as the quarter period ends. Only three percent of the 78,000 services are metered.

In order to take care of retirements and bond interest payments, a debt service program has been adopted with provision for payment of interest and principal on the bonds at maturity basis. Top load to be provided from revenues in the present program is to be $1,506,290 or one-half of the present annual revenue. This will be due in 1944.

Continuous Steel Girder Bridge Rigidly Connected to Pier Tops

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THE USUAL ARRANGEMENT of steel girder bridge spans and their supporting piers was almost reversed in the design of the Smith River highway bridge in northern California. Instead of the usual rocker bearings to provide for horizontal movement between piers and the steel spans, on this bridge the piers are considered to be hinged at the bottom and are rigidly attached to the girders at the top. Only one expansion joint is used in the four main spans (two of 180 ft. at the center and one of 150 ft. at each end), and the piers participate in angular deflections and horizontal movements of the girders.

This relationship was accomplished by making the shafts of the piers so narrow at the base (where they rest upon a steel pile footing) that they can be considered as hinged at that level. This footing is some 50 ft. below the deck of the structure. The piers have enlarged tops and are sufficiently well reinforced to take their share of the moment caused by the angular rotation of the girders at pier tops. Connections between piers and girders were made by welding hooked steel straps to the girder webs and embedding them in the concrete of the pier top. Even the end piers are thus attached since the girders run through them forming 45-ft. cantilever spans at the junctions with the concrete trestle approaches. The one expansion hinge in the steel girder is located at the $\frac{1}{3}$ point of one of the 180-ft. spans.

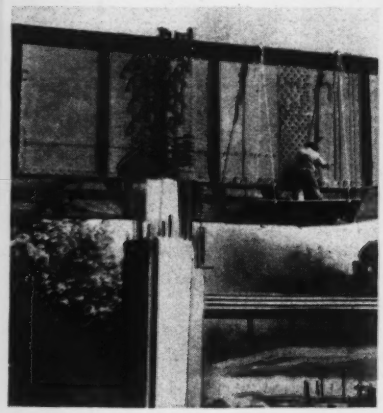

Fig. 2. Hooked bars welded to girder web anchor pier concrete to the superstructure.

Fig. 1. Piers and girders act integrally in this California bridge, rotation being allowed for at the base of the piers.

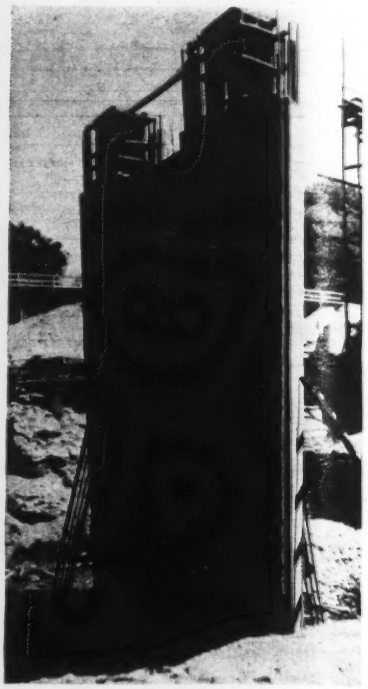

Fig. 3. Temporary inclined bars "fix" the narrow pier base until the girder spans were erected and anchored to the tops of the piers.

Points in favor of this design are that it makes the massive but otherwise rather inert piers participate with the girders in producing resisting moments to loads; and that increased horizontal stiffness results from fixing the piers at the top and using only one expansion hinge for the four main spans.

No particular difficulties were encountered in construction despite the departure from standard methods. The piers being hinged at the bottom made it necessary to supply additional stiffness at this point during construction. This was done by placing twenty-four $1\frac{1}{2}$-in. square bars in an inclined position between the pier shaft and the footing as shown in Fig. 3. After erection and when the fastening of the piers to the girders was completed, these bars were burned off.

The two 11-ft. steel girders support a 26-ft. reinforced-concrete slab roadway and two narrow sidewalks. The design provides for H-20 loading. The cost was about $6.70 per sq.ft. of roadway, rather low for a highway bridge of the spans used.

A Model for City Planning

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***Contents in Brief**—Models of the "City of Tomorrow" are interesting to look at, but a model of the city as it is today has much more usefulness. Los Angeles has made a scale model of its metropolitan district which has become one of the most important "tools" in planning work.*

TAKING A HINT from little Junior's toy building blocks and the miniature sets of Hollywood movie studios, Los Angeles city engineers have developed a planning technique that may save thousands of dollars in solving that city's traffic, engineering and planning problems.

Under the direction of the city engineering bureau, WPA workers have created a $140,000 scale model of the 7.4-sq. mi. metropolitan area between the Los Angeles River, Alvarado Street, Alpine Avenue and Washington Boulevard. This section, essentially the same as the original pueblo of Los Angeles, now includes the civic center area, the central manufacturing district, and the downtown business area. (Size of original pueblo of Los Angeles was 8 sq. mi.; present area is 451 sq. mi.).

Every building in this district is reproduced on the 24-ft. square model on a scale of 50 ft. to the inch, with architectural features and building colors faithfully copied. The model is built in demountable 6-ft. sections for ease in handling. The baseboard of the model is ¾-in. plywood, and all buildings are cut from white pine. Trees and landscaping are reproduced with plaster putty.

Employing an average of 30 men for five days a week, the project has required three years' work to date, and it is estimated that it will require six additional months for completion. By an agreement between the WPA and the city, Los Angeles has agreed to keep the model up to date in regard to all future building and street changes.

Data for the model were compiled by means of field trips and after these preliminary surveys, draftsmen drew scale plans for the buildings from which wooden replicas were fashioned by modelers. These were next painted in the proper color and assembled on the master model. Street, bridge and public rights-of-way information was assembled by the city engineering bureau under the direction of Lloyd Aldrich, who assigned deputies to supervise the project, and thus assured an accurate groundwork for the undertaking.

While the model has attracted an unending number of city hall visitors, it has also received the careful scrutiny of student groups, teachers, and professional bodies. Architects working on a new enlarged civic center plan have used the model extensively as a basis for preliminary studies. The replica of the downtown area as a whole readily lent itself as a basis for redesigning the civic center. This resulted in the creation of one of the two supplements which were made for the large model.

Model within a model

A replica of the proposed civic center was made on the same scale as the model so that it can be put into the model itself. The special architects' group appointed by the city and the County of Los Angeles, together with the city and the county planning commissions were represented in this interesting phase of the model, which was finished under the direct supervision of the county

Removing a building from City Hall Plaza is easy work for this Los Angeles engineer, who is working on the scale model which is used to facilitate planning.

regional planning commission staff.

The Los Angeles city planning department under the direction of Glenn A. Rick, and the rapid transit design division of the bureau of engineering, headed by Hugo H. Winter, have made use of the model in preliminary discussions concerning proposed freeways and highways in relation to the master plan of Los Angeles. Another novel supplementary model treats a section involving the Aliso Housing Project, and the adjacent junction of the Santa Ana and Ramona Parkways and the new Aliso Street Bridge. Like the civic center supplement, this study can be inserted in the large 24-ft. model; thus a preview of the completed project can be obtained before actual construction or condemnation is begun, and the various phases of such a complicated undertaking can be readily visualized in relation to existing streets and improvements in this particular area.

Special advantages

Sponsors of the model allege that it materially assists in clarifying issues arising from general improvement plans in the downtown area, and especially so at discussions before interested groups, boards and committees. This offers a definite advantage to any public relations program because many worthwhile projects have been defeated by opposition that has resulted from incomplete visualization. Engineers as a group have been slow in grasping the technique of utilizing proper public relations methods, and this use of a model certainly deserves study as a publicity medium.

The idea for the giant size model was largely fostered by use of a 16-ft. to the inch model made by the WPA under the supervision of the city bureau of engineering for the Olympic Boulevard opening and widening project. This undertaking served as a guide for demonstrating the most feasible method of widening, at the lowest cost to the city and the property owners. It gave material assistance in determining severance values and helped in eliminating lawsuits and costly arguments. This preliminary model was so successful that the model was later enlarged to include several additional miles along the Olympic Boulevard route, and subsequently abetted the development of the large 24-ft.-square model.

Trashrack and Drum Gate De-icers of New Design on Grand Coulee Dam

ICE PROTECTION for trashracks and drum gates at Grand Coulee Dam is important because of cold weather; winter temperatures in that locality have been recorded as low as 28 deg. below zero. Under these conditions the great amount of trashrack and spillway gate area on which ice could be harmful made it worth while to carry out an extensive investigation of de-icing measures. As a result of studies made by the U. S. Bureau of Reclamation, an improved method was developed for using air jets to bring relatively warm water from lower levels to the ice danger zone on trashracks and gates. Also, an electric heating system was developed for the seats for the drum gates and the pier plates at the gate ends. The feature of this system is a design that heats the metal by currents induced in the iron plates themselves. This makes it possible to use only a relatively low temperature in the electric cables and reduces danger of overheating the adjacent concrete.

Tests made on nozzles of different design in a glass-sided tank show best results in water circulation when the nozzle is set to discharge compressed air vertically downward. The smaller bubbles thus produced are more effective in inducing the desired water movement; an insulated tank and water cooled to the desired temperature were used in the tests which were continued to the point of determining desirable diameters and spacings of orifices, air pressures, and other characteristics.

Fig. 1. This is the side of the pier plate against which the concrete is poured. Rubber-insulated cables pass through stiffener ribs of the pier plate. The cables are curved to avoid stresses resultant from length changes under temperature variations.

Copper pipes with bronze nozzles are being installed in the dam at locations such that it will be possible to discharge air into the water from nozzles 10 to 35 ft. below the surface. This system is to prevent ice formation for all water surface levels between El. 1220 and El. 1290. In addition to the installation on the trashracks similar nozzles are located every 12½ ft. along the spillway, making a total for the dam of 1,480 nozzles.

The standard orifice size is a drilled holed ⅛ in. in diameter, this size having been made "as large as practicable to lessen the possibility of clogging." Each nozzle will discharge 2 to 3 cu. ft. of free air per minute with the differential pressure across the nozzle varying from 2 to 4 lb. per square inch.

The air branch lines are ¾ in. in diameter and are served by 1-in., extra-heavy, hard copper pipe with bronze, soldered-joint fittings. Main air lines (totaling about 4,000 ft.) consist of 4-in. standard galvanized steel pipe. Four electrically operated compressors (each with a capacity of 380 cu. ft. of free air per minute at 40 lb. per square inch gage pressure) are located in the inspection galleries of the dam at convenient points. At maximum demand requirement, the system is able to discharge about 3.1 cu. ft. of free air per minute (at 40 lb. per square inch) through each of 503 nozzles, the maximum number expected to be in simultaneous operation.

In addition to the warm water circulation, electrical heating is required in the pier plates and gate seats because the gates can be raised out of the water. There are eleven of these gates, each 135 ft. long and 28 ft. high. They recede into chambers into the spillway to give a smooth path for overpouring flows. A hori-

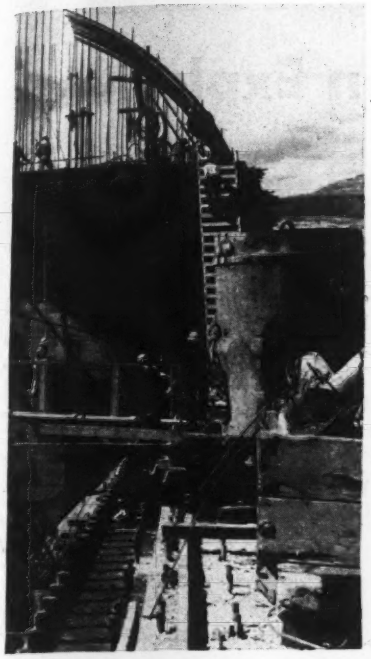

Fig. 2. Looking across one of the eleven 135-ft. spillway gate openings toward the steel pier-plates behind which the heating cables are installed.

zontal hinge on the upstream edge of the gate allows it to swing up and down as it floats on water in the gate chamber in which level is controlled by water from the reservoir. Water seals are used on the ends of the gate and on up- and downstream edges of the chamber to minimize leakage. It is in the region of these seals that ice would be a menace to dependable operation.

Best means of de-icing at these vulnerable points, it was decided, is the use of electrical conductors threaded through holes in the stiffening ribs of the pier plates themselves. The current causes a magnetic effect that generates eddy currents in the iron around each hole. Thus 78 percent of the total heat generated is developed in the iron itself. Under this plan heat transfer from the conductor is minimized and the operating temperature of the copper cable is kept much lower than it would be in an ordinary resistance-type heater unit.

For the pier plate installation, the copper cables (protected by heavy rubber insulation) are threaded through holes in the webs and after being thoroughly tested out are embedded in concrete. This construction makes this portion of the installation inaccessible for repairs or replacements. To insure long life, the insulation used is much heavier than ordinarily would be required for this service.

In the gate seat, steel angles are used to form a space for the heating cables, thus making this part of the heating installation accessible by removing the angles. To improve heat transmission in the gate seat installations and keep cables dry, space around the cables is filled with asphalt.

Laboratory tests in which field conditions for the electrical heating system were simulated by embedding the plate in concrete, indicated that the required amount of heat (70 watts per square foot) can be obtained by using three #1 AWG cables operating in parallel and each carrying about 250 amp. The operating temperature of the cable is not expected to exceed 70 deg. F. when the installation functions with air temperatures 28 deg. below zero.

Laboratory tests on small sections of the pier plates indicate that 215 kva. at 50 v. will be used in heating the exposed surfaces of one drum gate. The switching arrangement permits heating the plates on one side of a pier without heating the other side. Possible temperature differences that might result led to putting extra reinforcing steel in the piers and in the roadway bridge spans over the gates. To protect the concrete from excessive temperatures (150 deg. F. was assumed as a safe maximum) thermostats are installed which trip the circuit breakers at 125 deg. F., thus allowing a considerable margin of safety. These circuit breakers cannot be reclosed until after the thermostat has been reset manually.

Water and Sewer Charge Methods

ABOUT twenty different forms of sewer rental or sewer service charges are now followed, according to an American Water Works Association committee. The methods, which were described by Chairman Leonard N. Thompson, general superintendent and engineer, St. Paul, Minn., water department, in a report at the association's annual meeting at Toronto, Ont., June 22–26, include forms based upon: uniform charges, quantity of water consumed, number and type of plumbing fixtures, number of persons served, type of premises, character of sewage, or upon a combination of one or more of the above methods. The water superintendent, as administrator of such collections, should be vitally interested in and consulted in the establishment of any sewer rental rate structure, the committee reported. While the burden of responsibility for the rates should remain with the sewer division, it is highly desirable that they be made with the advice of the waterworks executive.

The report stressed that in determination of the proper basis the first thing to determine is the portion of total cost which can be properly borne by the city as a whole, that is, collected by taxation with the balance to be collected as a reasonable charge against the users in proportion to the benefits derived.

Apparent trend through experience prompted the committee to favor a charge based on metered water consumption as a percentage of the water bill, or directly on a consumption basis. A uniform rate is not fair to the small consumer, and a rate based upon fixtures is difficult to administer. Metered water is the closest approximation to the use of system, practical of application.

In discussion of Mr. Thompson's report, John A. Hickey, director of public utilities at Cleveland, Ohio, pointed out that in his city the duties of billing and collecting sewerage charges is the function of the division of water and heat, bills are rendered quarterly, and the sewerage service charge is placed upon the bill with the water.

Principal difficulty in Cleveland has been the question of exemptions from the sewerage service charge. Over a period of 18 months, during 15 of which the users of the sewerage service were billed at the rate of 40 percent of the water bill, and 3 months at the rate of 25 percent, there was placed on the department's books the sum of $1,756,152. Of this amount $343,226 became delinquent. These unpaid charges were certified to the county auditor and placed as a lien upon the real estate served. There were 19,615 delinquent accounts representing over 16 percent of the 121,971 total.

Offset Shooting for Foundation Exploration

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Contents in Brief—In seismograph determination of subsoil conditions a triangular layout of shot and detector positions enables layer thicknesses and depths to rock to be determined accurately and economically.

EXPLORATION OF DAM SITES by seismograph as described by A. E. Woods in "Dam Site Surveying by Seismograph" (*ENR*, March 28, 1940, p. 46) depends on using the sum of the depths to rock under shot point and detector, according to the Ewing-Rutherford method of interpretation. For overburden 100 ft. deep, shot lines as long as 800 ft. may be required. On lines of such length *average* depths to rock are of limited value, particularly where the rock surface is sloping or the ground surface irregular. Increasing use of the seismic refraction method and gradual improvement in instrumental equipment have shown a need for more refined methods of shooting and interpretation in foundation exploration.

An improved method, the offset shooting method, will yield subsurface information with much greater accuracy than methods previously used and give more information with a substantial saving in labor and explosives. Many of the simplifying assumptions of other methods are avoided. Its important advantages are:

1. The depths obtained pertain to specific locations and are not average values along a line.
2. The three depths obtained at each set-up are located at the vertices of an equilateral triangle, so that the true slope of the rock surface may be determined.
3. The accuracy of the information is increased, as the critical distance on which previous methods are based is not used.
4. Three depth determinations for each set are obtained with fewer shots, thus reducing the cost and speeding up the work.

Principles of the method

Fig. 1 shows the path of a seismic wave which follows Snell's law of refraction. The interfaces are assumed to be horizontal where they are crossed by the wave path. The total line of wave travel $T = T_{ab} + T_{be} + T_{ef}$, or the sum where T_{ab}, T_{be}, T_{ef} of the wave travel times along the path segments *ab*, *be* and *ef*, respectively.

Let V_r = true velocity in sound rock, to be checked in three directions, if necessary.

X = distance from shot point to detector.
aR = offset distance at R.
fS = offset distance at S.
b = sum of delay times.

T_R = delay time at R; $T_R = T_{ab} - \frac{aR}{V_r}$

T_S = delay time at S; $T_S = T_{ef} - \frac{fS}{V_r}$

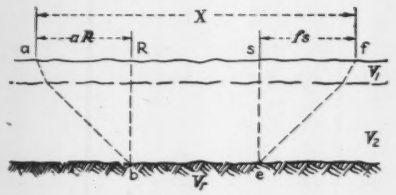
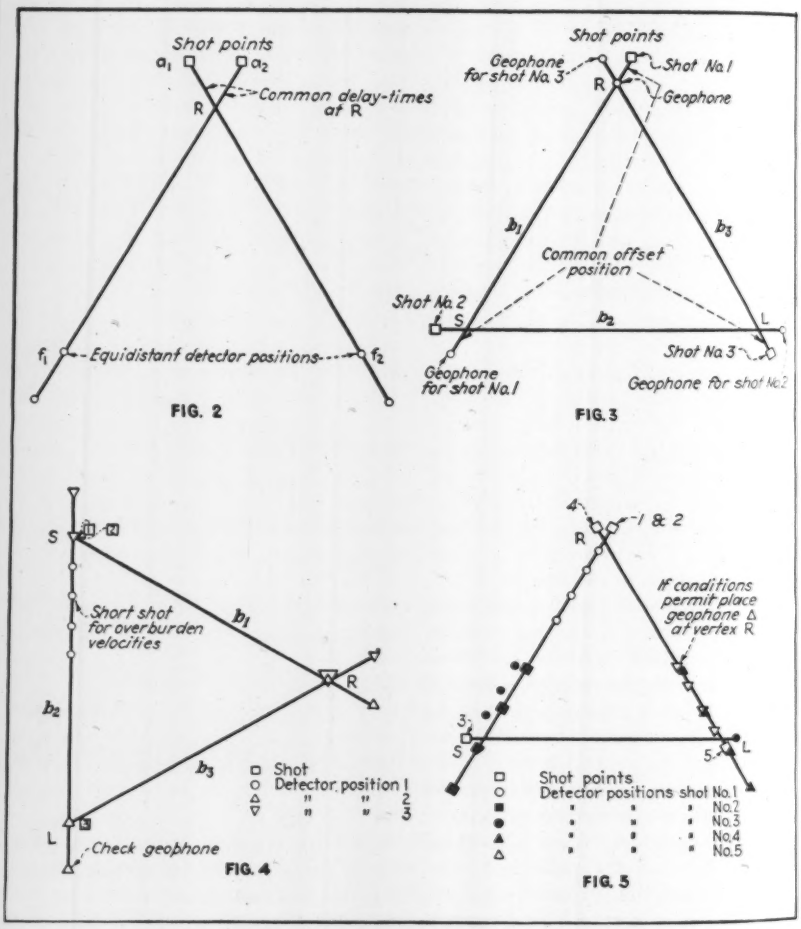


Fig. 1. Path of seismic wave used for calculation of delay times due to overburden.



Figs. 2 – 5. Use of common delay time in different shooting layouts.

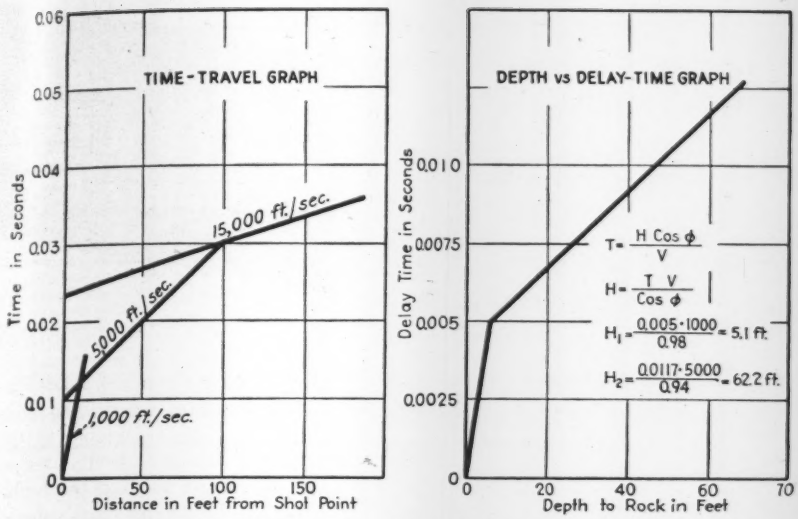


Fig. 6. Graph of computed depth vs. delay time gives reading of rock depth.

As the sum of the delay times is the excess time of travel, along the actual path, over the time of travel along the full distance X in rock, we have

$$b = T - \frac{X}{V_r} \qquad (1)$$

Eq. 1 forms the basis of the offset plan of shooting. From a single set-up it is impossible to determine accurately the delay time in the overburden under the detectors. The delay time ordinarily obtained is an average of the delay times through the overburden under the shot point and the detectors, or half the sum of the delay times at each end of the line. But by shooting two lines that have one overburden delay time in common, as in Fig. 2, it is possible to make an independent determination of the overburden delay times at each end of the line.

If a triangular shooting pattern is used, as in Fig. 3, the basic equation gives the relations,

$$b_1 = T_R + T_S$$
$$b_2 = T_L + T_S$$
$$b_3 = T_L + T_R$$

Solving and substituting

$$b = T - \frac{X}{Vr}, \text{ we obtain}$$

$$T_L = \tfrac{1}{2}\left(T_2 + T_3 - T_1 - \frac{X}{V_r}\right) \qquad (2)$$

where T_L is the delay time at L or difference between the time required for wave travel from rock surface to geophone and the time required for the rock wave to traverse the offset distance. Likewise

$$T_R = \tfrac{1}{2}\left(T_1 + T_3 - T_2 - \frac{X}{V_r}\right) \qquad (3)$$

$$T_S = \tfrac{1}{2}\left(T_1 + T_2 - T_3 - \frac{X}{V_r}\right) \qquad (4)$$

Application of method

A shooting pattern as shown in Fig. 4 is applicable for the simple two-layer case with shallow overburden made up of two materials with distinct velocities of wave travel. For the more general case involving three or more layers, a shooting pattern such as that shown in Fig. 5 is adequate; however, by the addition of a sixth shot near L and with the detectors on the line S to L, the velocity of the seismic wave in rock is checked in three directions and the overburden velocities are checked at each of the three points of determination. By checking each velocity component at each point of determination no assumptions as to the uniformity of the overburden between stations are necessary. If the velocity components at each point of determination are found to be the same only one depth-delay time graph need be constructed, while if variations in the velocity are found separate graphs are used.

Having obtained the delay times at L, R and S, it is necessary to convert these values into depths. They may be plotted in the form of a depth-delay time graph taken from the relation, delay time $= DT = \dfrac{H \cos \phi}{V}$, where H is layer thickness, V is velocity in H, and ϕ is the angle of inclination to the vertical of the hypothetical wave path. From the graph, as in Fig. 6, the depths at R, S, and L may be read directly for the respective delay times.

The delay-time method has been described by J. H. Jones (*Proc.*, World Petroleum Congress, Part 1, 1934). The depth delay-time relation has been further developed by L. W. Gardner (*Geophysics*, Oct., 1939).

Thames River Canalizing Opposed as Impracticable

CANALIZATION of the River Thames, England, by means of a dam and locks near the mouth, in order to convert it into a great elongated harbor for the Port of London, has been proposed many times, and was referred to in a recent address before the British Institution of Mechanical Engineers by Asa Binns, chief engineer of the Port of London Authority. At the time of the latest proposition of this kind, in 1934, Mr. Binns made a thorough study of the situation and arrived at the conclusion that the construction of such a dam would be disastrous to the port.

His reasons for the adverse decision are summarized in *The Engineer* London, as follows: (1) The danger and inevitable delays in passing the whole traffic of the port through the locks. (2) The interference with the tidal regime of the river, and its effect on dredging both above and below the dam. (3) The effect on the public health of London by the impounding of the water above the dam at the level of high water; low-lying property would become uninhabitable, cellars and vaults would be flooded, and there would be unfortunate effects on adjacent tunnels, gas, water and electric mains; during a period of summer drought the Pool of London would become the "cesspool of London". (4) The project would cost at least $33,000,000, traffic would be gravely inconvenienced during the period of construction, and the operating costs of the dam and locks and attendant staff would put a heavy financial burden on the trade of the port. (5) The dam would be a source of weakness in war time, as it would be a target for aircraft and its destruction would paralyze shipping.

BUILDING DESIGNERS' LIBRARY

Economics of Air Conditioning and Basic Data for Cost Estimating

Realto E. Cherne
Carrier Corporation, Syracuse, N. Y.

***Contents in Brief**—Cost data for "blackout" industrial plants not available in form comparable to more conventional types of buildings. Expected life of plant, particularly defense plants, affects economic considerations of air conditioning. Installation and operation costs discussed.*

ANY CONSIDERATION of air conditioning, whether it be fundamental research, equipment design and development, application engineering, sales, installation, service, or business management, sooner or later comes face to face with economics. Although there is more immediate concern with the production of defense materials than an *n*th decimal place analysis of the economics of a particular situation, air conditioning represents a facility for furnishing a service to produce results which bring economic and health advantages to the user.

Defense plants

Effort is now centered on the construction and operation of plants for production of defense materials. It is generally known that many of these plants are being completely air conditioned, manufacturing space as well as engineering and drafting departments, and office space. Some plants require as much as 6,000 or 7,000 tons of refrigeration.

Comprehensive data are not available on the relative over-all costs of the windowless, air conditioned buildings, popularly called "blackout" plants, as compared to the more conventional air conditioned type of building. One large firm of engineers and contractors has stated that the complete cost of the former runs about 30 percent higher. Based on this general statement, just what does the plant operator obtain for this increased cost? Important are: increased production due to the conservation of the workers' health and energy, uniformity of product and reduction of accidents due to fatigue (which comes quicker and is more pronounced at high temperatures).

Since the cost of the air conditioning, refrigeration, and auxiliary equipment is directly related to the amount of outdoor heat passing through walls and roof of the building, internal heat-gain from people, machinery, process and lights, unit-of-capacity cost figures apply to defense plants very much the same as for other industrial applications or even large-sized comfort installations.

One important difference in the economic situation is a possible emphasis on low first cost of defense plants at the expense of higher operating costs due to the questionable useful life of the building. Another important consideration is the supply of materials of manufacture which may relegate over-all economics to the background in favor of quick delivery of equipment constructed with available labor and materials.

Obviously, any generalized question as to the cost of a complete year-round heating and air conditioning system for a building of stated size is ridiculous and incapable of an off-hand answer. Yet with a little perti-

TABLE I—APPROXIMATE COSTS OF ALL-YEAR AIR CONDITIONING

Application		Unit Prices: Sq. Ft. Net Area Low	Sq. Ft. Net Area Average	Sq. Ft. Net Area High	Person Low	Person Average	Person High	Ton refrigeration Low	Ton refrigeration Average	Ton refrigeration High	CFM supply air Low	CFM supply air Average	CFM supply air High
Banks		$1.25	$2.00	$3.50	$80	$140	$320	$350	$480	$700	$0.95	$1.40	$2.75
Department Stores	Basement	.60	1.00	1.15	25	40	100	250	325	400	.60	.80	1.00
	Main floor	.60	1.05	1.25	25	40	80	250	325	400	.60	.75	.90
	Upper floors	.60	.90	1.10	30	45	100	300	350	400	.60	.80	1.00
Hotels — guest rooms		.....	.....	.....	240*	300*	420*	.....	.....	.....	.....	.....	.....
Office buildings		0.85	1.25	2.00	110	135	180	300	375	500	0.75	1.05	1.50
Offices — small suites		1.00	1.75	3.25	110	180	350	300	450	800	.75	1.25	2.50
Restaurants		1.40	2.20	3.50	15	18	25	215	280	400	.....	.....	.....
Specialty Shops	Barber shops and beauty parlors	1.50	2.50	4.00	50	100	150	325	400	500	0.70	1.00	1.50
	Dress shops	1.25	1.50	2.00	45	55	75	230	275	350	.....	.....	.....
	Drug stores	1.25	1.50	2.00	45	55	75	240	275	325	.....	.....	.....
	Five-and-ten	.90	1.20	2.80	22	33	55	220	270	425	.80	.95	1.50
	Shoe stores	.95	1.20	1.75	35	40	50	230	275	350	.....	.....	.....
Theatres		.....	.....	.....	9†	15†	23†	215	300	450	0.65	1.00	1.25

There is a wide variation in unit prices such as shown above, due to differences in load concentration (see table in Chapter XIX) and in complexity of physical layout. Prices cover air conditioning work only, for year-round use (except the "low" column, which in general includes summer cooling only). Net area (sq. ft.) includes corridors, but excludes elevators and service spaces. *Excluded* are the cost of plumbing and steam connections, electrical wiring, painting and redecorating, building construction and alterations, and boilers or burners. Low figures in general are simple direct expansion systems using city water for condensing. High figures are usually chilled water systems with cooling towers or evaporative condensers, and may be considered high quality systems as well. Table is based on 1940 costs.

* Price per room. † Price per seat.

TABLE II—AVERAGE DISTRIBUTION OF COST FOR ALL-YEAR AIR CONDITIONING

Type of System and Application	Per Cent of Total Installed Cost: Air Conditioning equipment complete	Ducts	Chilled water piping	Mechanical refrigeration and refrigerant piping	Cooling towers or evaporative condensers, piping, pumps
Compact, direct expansion unit systems for small shops	30	15	.....	35	20
Direct expansion central systems for medium-sized stores and restaurants	27	26	.....	31	16
Extensive chilled water systems for large department stores	25	24	10	28	13
Extensive chilled water systems for office buildings, hotels, etc	25	30	10	24	11
Direct expansion systems for small and medium sized theatres	23	29	.....	32	16

Above does not include: Electric wiring, plumbing and steam piping, building alterations or construction, painting and redecorating, boilers or burners.

nent information and about two hours' time, it is possible to arrive at an estimate suitable for budget purposes. Of course details require time and a systematic series of calculations.

These are the principal factors affecting first cost:

1. Conditions to be maintained.
2. Internal summer heat load in the space.
3. Quality of equipment. (Involves apparatus efficiency, life, obsolescence, as well as sound application engineering practice.)
4. Degree of air cleaning required.
5. Degree of automatic control required.
6. Available space for apparatus, ducts, piping, etc.
7. Health and safety hazards involved.

The best way to obtain an economical air conditioning system is to consider its design in conjunction with the fundamental building design. Honest coöperation between owner, architect, engineer, and contractor, will insure good final results, at the best price. Best price does not mean lowest price, or high price, but rather an over-all consideration of investment, operating, and maintenance cost. Also, appearance, reliability, and quality and availability of future service work are intangible considerations.

Unit costs

Architects and engineers frequently ask why an array of unit costs could not be made available for simplifying preparation of budget estimates. The greatest problem is lack of similarity of construction, building occupancies, and types of air conditioning systems. Analysis of hundreds of estimates has resulted in the approximate prices shown in Table I. Prices are expressed in dollars per square foot of floor area, per person, per ton of refrigeration, and per cfm. of supply air. They cover installed equipment complete with the exception of: plumbing, steam connections, electrical wiring, building construction, cutting and patching, boilers, and painting and decorating. These supplementary items (except boilers) vary greatly, but if a quick figure is necessary an allowance of 10 to 15 percent of the air conditioning price would cover them.

Note that it is necessary to show low, average, and high figures. Also note that the spread between these is considerable in many cases. Therefore, this table is best used for rough checking of estimates rather than creation of project costs.

A better method to use in preparation of budget estimates for larger jobs is to follow the procedure given below:

1. Calculate the loads so as to obtain the approximate air quantity and tonnage required. This need not be done in detail. For a single area only about an hour or so is needed. Divided spaces require repetitive calculations.

2. The next step is to determine the type of system most suitable to meet the requirements: unitary or central station; single or multiple apparatus; well water, direct expansions, or chilled water; air distribution means, etc.

3. If possible, select and accurately price major items of equipment.

4. Arrive at approximate costs of variable items such as duct work, piping, controls, and miscellaneous sheet metal items. Comparison with previous installation is about the best way to accomplish this.

5. Add all costs, make an allowance for inevitable changes and addition of items.

Component costs

Further analysis of estimates allowed construction of Table II. The average distribution of the cost of the various items which compose the complete air conditioning system is expressed in percent. Note that the cost of the complete air handling equipment (fans, filters, heaters, dehumidifiers, their controls and auxiliaries) varies between 23 and 30 percent for the various classifications; mechanical refrigeration and refrigerant piping varies between 24 and 35 percent of the total. An interesting use of these data is to show the relative importance of the cost of various items which might be affected by alternate system layouts.

It is almost needless to point out that unit costs are useful only for obtaining approximate prices or for comparison of several alternate layouts on a particular proposition. The only way to obtain an accurate estimate is to complete all of the design calculations, make a scale layout, and then proceed with detailed labor and material take-offs.

Annual costs

Despite the fact that too many purchasers of air conditioning find themselves in situations where lowest first cost is practically the only thing considered, the thoughtful buyer always makes an over-all analysis which boils down to annual charges for operation and use of capital.

Fixed charges are considered to include allowances for depreciation, interest, taxes and insurance. Depreciation should take into account obsolescence as well as deterioration. The interest charged may not equal the current financial rate but be based rather on the relative value of capital diverted from other uses.

A simple formula for calculating annual fixed charges is:

$$F = \frac{100}{Y} + \frac{Y+1}{2Y} \times I$$

where: F = Annual fixed charge (% of first cost)
Y = Depreciation period (years)
I = Annual interest rate (%)

To this must be added taxes and insurance.

Operating costs include energy

cost, labor cost, and maintenance cost. Energy cost calculations involve a number of variables, of which outside weather is the most difficult to predict. Formulas and other data for such calculations are too long to be included here. Labor costs are readily calculated on the basis of man-hours required and the value of such time. Maintenance, again, involves too many variables to allow expression in simple figures.

Operating costs

Up to about ten or twelve years ago very few air conditioning systems were equipped with sufficient meters to allow keeping accurate logs of actual operating costs. Therefore, to estimate approximate operating costs in advance of installation, it was necessary to complete tedious calculations which still left the answer in doubt.

In recent years it has been possible to obtain actual operating costs on a number of varied types of installations. It is interesting to learn that these costs can be related to the installed cost of the system (excluding supplementary items previously listed) and the average annual cost of power, water, steam, maintenance, repairs and labor is about 7 percent of the first cost. This percentage varies from about 5 percent for high-priced systems to about 10 percent for very inexpensive installations. Most of the data are from systems operating about 8 to 10 hours per day. One observation which appears obvious on consideration is that for the larger installations a well trained and well paid operator is more than justified.

The material in this article was first presented by Mr. Cherne in a paper at the Second Annual Air Conditioning Institute, at Massachusetts Institute of Technology, June 23–24. The two tables appear in the book "Modern Air Conditioning, Heating and Ventilating,"—Carrier, Cherne and Grant.

Civil Service Benefits and Limitations

ONE OF THE GREATEST FAULTS of a city charter and other statutes is that the civil service provisions in some of them are drawn in such detail that a "frozen" condition is created, according to H. A. Van Norman, general manager and chief engineer, Bureau of Water Works and Supply, Los Angeles, Calif., who expressed his views at the recent annual meeting of the American Water Works Association at Toronto, Ont. Other highlights of Mr. Van Norman's paper and the discussion that resulted are given by the following abstract.

Such a situation is unhealthy to a city administration when it prevents the civil service department from keeping in step with modern trends. Civil service laws would be much better if they were worked up in the light of an enabling act. Give the civil service a base line from which to extend their jurisdiction so that by simple modification of their rules and regulations they can readily meet the demand of time.

A weak classification plan will definitely limit the effectiveness of civil service jurisdiction. There is a tendency on the part of civil service boards to create an excessive number of classes; in part, this tendency is due to a political maneuvering where the plan is so unstable as to permit the abuse of the merit system.

The expense of an examining division in a civil service department would most probably be in direct proportion to the number of classes being administered under the system. It would be in the interest of economy, therefore, to limit the number of classes under civil service. There are direct disadvantages to the operating functions in controlling personnel under an excessive number of classes. In the waterworks industry, the engineering series of classes is most common and if numerous steps are established in the promotional series it becomes difficult to differentiate between the types of work performed by the engineering staff. In large organizations, especially those having retirement plans, the movement of personnel up the promotional ladder creates numerous changes annually. If the steps in a promotional series ladder are narrow, the changes will be increased and the number of examinations likewise increased. If the civil service output is geared to the rate of promotions, and tax funds are available to continue the necessary pace, the ill effect of too many classes is somewhat minimized.

In discussion at the meeting John B. Probst, chief examiner, civil service bureau, city of St. Paul, Minn., pointed out that there are very few real merit systems in public personnel administration and that most of the merit systems are merely "civil service" systems. According to Mr. Probst, a city does not have an "adequate" civil service, if:

(1) Administrative heads are compelled to give war veterans preference in appointment, irrespective of a man's relative ability or standing on the eligible list;

(2) Administrations must work under an inflexible seniority system as the sole determining factor for various administrative actions;

(3) Higher jobs are filled with men deficient in the requisite qualities of leadership and executive ability; and

(4) The law deprives the administration of reasonable discretion in maintaining discipline or in effecting separations of employees whose services are distinctly below average.

Mr. Probst favors a merit system, which he sees having advantages as follows:

(1) Freedom from political influence and pressure in dealing with employees.

(2) Executive has more time for constructive work in better administration instead of dissipating his energies in dispensing political jobs.

(3) There is a better opportunity to maintain continuity of good personnel policies and practices and consequent better service to the public through higher employee morale.

Discussion

Edward V. Buchanan, general manager, Public Utilities Commission, London, Ont., in discussion also made known that as far as he was aware no Canadian city has any civil service system comparable to the system in force in numerous larger United States cities. The only extensive civil service in Canada, Mr. Buchanan explained, is that of the federal government, which system was described as functioning very well.

From Field and Office

Working problems and time-saving methods for engineers and contractors

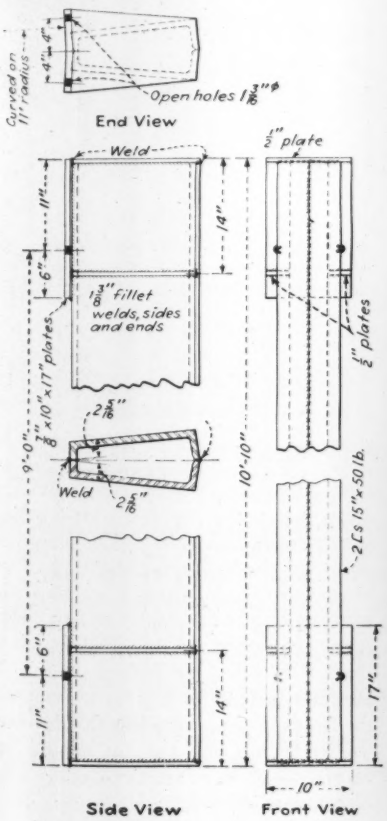
Tapered Trash Rack Bars

Trouble with trash racks on San Gabriel Dam No. 2 led the Los Angeles County Flood Control District to develop a new design in which clearances between each pair of bars increases in the direction of flow. Thus any object that can start through the grillage will surely pass on through. In addition, each bar and its support is designed for full static head to prevent collapse if debris clogs the grillage.

The bars, placed vertically in a circular intake tower that leads the water through 84-in. butterfly valves, are set to give a clear open space of 15 in. at the outer face and this clearance increases to $16\frac{3}{8}$ in. at the inner face of the grillage. Each bar is an individual beam designed to carry the full load due to the maximum water head. It is fastened to its concrete supports by four expansion bolts placed in the forms before concrete was poured.

In designing the new headworks, it was decided that the old clearance of $5\frac{1}{2}$ in. between trash rack bars was unnecessarily close and would be conducive to collecting a debris mat that would be likely to choke the opening and transfer at least some of the hydraulic head to it. With a valve so large as an 84-in. butterfly, it was believed that a 15-in. clearance would be ample, and this was accordingly used.—PAUL BAUMANN, *Senior Assistant Chief Engineer, Los Angeles Flood Control District.*

Details of vertical steel bars used in the trash rack tower.



Dangerous Headwalls Removed

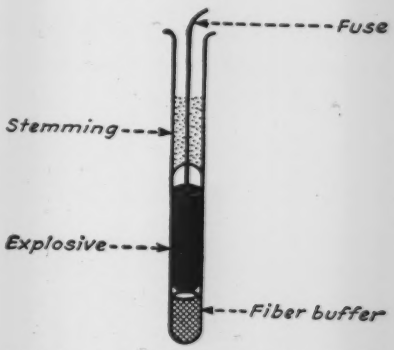
Culvert headwalls along Illinois highways figured in 242 accidents causing deaths to 44 and injuries to 418 persons during 1938. These culvert headwalls were originally constructed for definite purposes which at that time did not interfere with the safe movement of traffic. When it was discovered that headwalls did jeopardize the safety of motorists, immediate steps were taken by the department to remove the existing ones and to alter their future design.

The illustration below shows the improvement occasioned by removing the headwalls and replacing with painted posts. The headwalls were removed by the Illinois highway department.

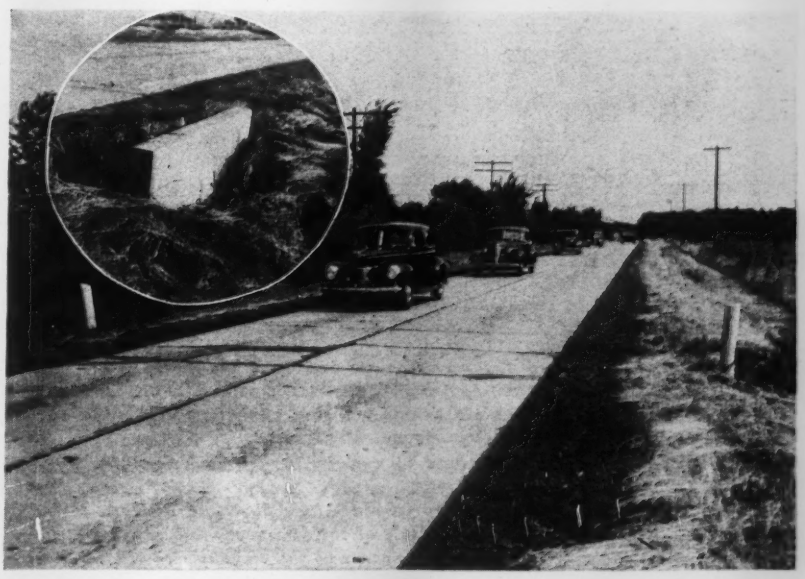
Had it not been for compulsory reporting of motor vehicle accidents, the danger of these seemingly harmless headwalls probably would have gone unnoticed for some time.

Buffer Base for Blasts

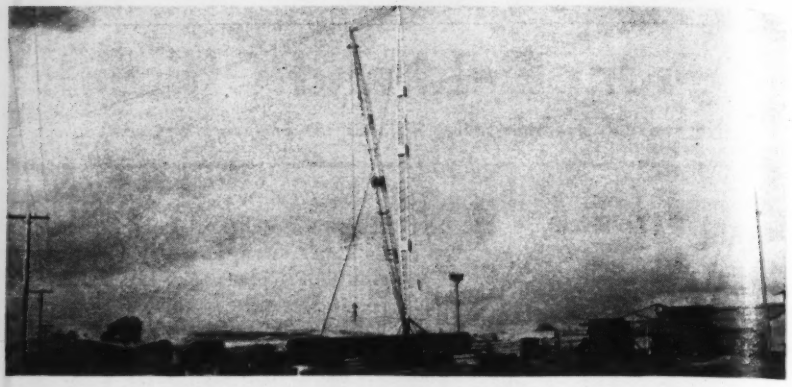
In many construction jobs it is necessary to leave the formations at the bottom of a blast-hole intact. Since an explosive charge, placed in the ground, exerts force downwards as well as towards the sides and surface, the base of the shot-hole and for some distance below it is invariably shattered by the blast. Such underbreakage is now being prevented by the use of a resilient buffer.



Buffer in blast hole prevents downward break.



Each blast-hole is drilled one-third deeper than the length of the powder column; thus, if the dynamite or other explosive extends up the hole 12 in., a pocket 4 in. deep is drilled at the bottom. This pocket is filled and tamped tightly to the top with asbestos fibre, or rock-wool. The charge of explosive is placed snug on top of the fibre, stemmed and fired in the regular manner. The downward kick of the blast is softened by the resilient buffer, and vibration force is controlled to an extent where underbreakage below the hole is a rarity. Normal force, expended against the sides of the hole is not disturbed. The advantage of asbestos fiber over other buffer material is that it does not burn out at the critical moment in the intense heat generated by the blast.—F. R. COZZENS, *Equity Oil & Gas Co., Stockport, Ohio.*

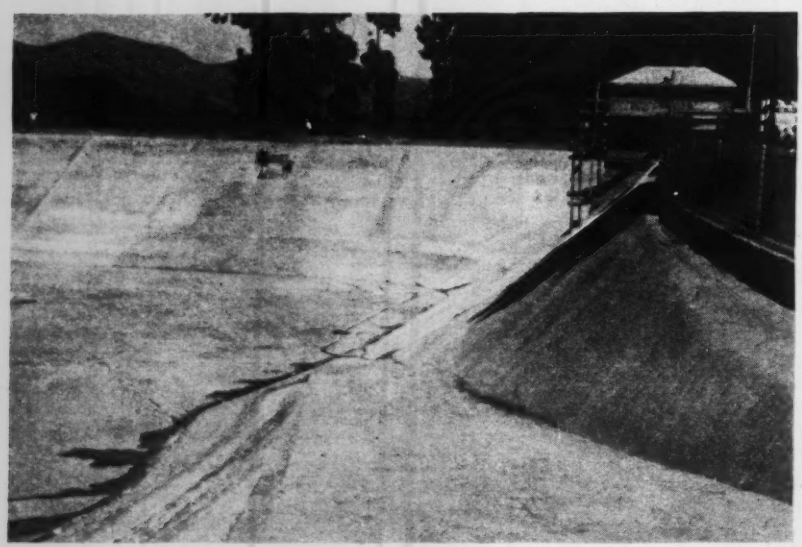


All the area reached by this boom in full-circle swing can be used for storage.

Boom Aids Carpenter Work

The entire area of the 250-ft. circle around a centrally located derrick mast is useful, in the carpenter shop area at Friant Dam, for construction operations and storage of parts that require use of the derrick either in assembly or loading the finished parts on flat cars for shipment to the dam two and one-half miles upstream.

The full circle swing of the boom is made possible by the use of long guys. Where the ground slopes down near one edge of the circle, a timber A-frame is used to hold one of the guys to a height necessary for the required clearance. The mast is 140 ft. high and the boom has an effective reach of 125 ft. Items which it handles extensively are the complicated forms for inspection galleries in the dam, the 10x50-ft. metal-faced movable concrete form panels and numerous bulky items ordinarily a part of concrete dam construction. The wood-shop proper which occupies a portion of the area, consists of a shed roof to protect power-driven tools and seasoned lumber from rain and sun. Side walls were not considered necessary.

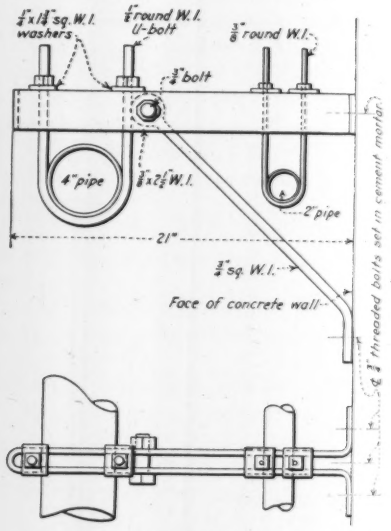


THIS ROAD leading down the paved side and into the bottom of Summit Reservoir of the East Bay Municipal Utility District, Oakland, Calif., shows how provision is made for trucking out heavy sediment collected in cleanup operations. Although there is a sluiceway into which reservoir scourings can be washed, it has been found undesirable to load up the wasteway discharge channel with the heavier materials.

The road, which follows standard practice in the East Bay District, makes it possible for a motor truck to take the bulk of the sediment to a suitable dumping ground. Final hosing down sluices the remnants of the cleanup into the wasteway.

Home-Made Wall Bracket

A wall bracket that can be made by a job or local blacksmith and that will serve many purposes in machine shop and powerhouse is shown by the accompanying sketch. Materials and dimensions are shown by the



drawing. As can be seen, the U-strap that forms the horizontal member permits the U-bolt pipe hangers or pillar blocks for the shafting to be moved toward or away from the wall, making alignment and spacing easy. Also, if desired the inclined member can be reversed or swung up to act as a tie instead of a strut to support the bracket arm, but when this is done the wall bolt for the tie should be larger.—C. E. NIGHTINGALE, *Old Greenwich, Conn.*

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They're built to grip rope and hang on regardless.

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MEN AND JOBS

R. L. McCarthy, junior engineer in the Public Works Department, city of Dallas, Tex., has resigned his position to enter the WPA staff at San Antonio, and **Graham Hatch,** sanitary engineer for the health department at Dallas, has been called by the Army for active duty. He was a member of the Reserve Corps.

Orry R. Fox, who has been superintendent of state highways in Wyandotte County, Ohio, has resigned that position to become general superintendent of maintenance at Division No. 1 (comprising eight counties), of the state highway department, with headquarters at Lima.

Arden O. Gourley, of Franklin, Pa., has been appointed resident engineer, District No. 1, Pennsylvania department of highways, with headquarters at Franklin.

Harry S. Bronson, county surveyor of Ramsey County, Minn., with headquarters at St. Paul, has been ordered to active duty with the Coast Artillery Anti-Aircraft Reserve, in which he holds a major's commission. Major Bronson, who will be with the chief of staff at the Seventh Corps Area at Omaha, Neb., has been granted a year's leave of absence by the board of county commissioners. **M. W. Carley,** principal assistant county engineer, will become acting county surveyor in Major Bronson's absence.

Dean H. M. Crothers, of the University of South Dakota, has been called to Washington, D. C., in connection with the defense industry training program; **H. B. Blodgett,** head of the civil engineering department, will be acting dean of engineering during Dean Crothers' absence.

The following changes are effective in the Idaho department of highways, as announced by S. E. Johnson, acting director: **C. C. Hallvik,** materials engineer, has assumed the added duties of construction engineer; **J. A. Chamberlin** has been transferred from planning survey manager to the new post of survey and plan engineer; **J. H. Clabby,** staff engineer, succeeds Mr. Chamberlin. The position of staff engineer has been eliminated.

Russel P. Mann, of Boise, Idaho, has been assigned to the Sunnyside division of the Yakima reclamation project near Yakima, Wash., as junior engineer; **Olaf W. Lindgren** has been transferred to the position of office engineer with the Yakima project.

Col. Harry J. Lamb, D.S.O., M.E.I.C., district supervising engineer for Ontario for Dominion department of public works, has retired after 41 years of service. Col. Lamb is a graduate of the R. M. C., Kingston, Ont.

The official bulletin of the U. S. Engineer Office, Huntington, W. Va., announces the following changes in personnel: **Norman J. Black,** junior engineering draftsman was appointed by transfer from the department of agriculture on May 16, and was assigned to duty in the design section, district office; **Henry B. Daniel,** apprentice draftsman, design section, has been placed on leave as of May 15 because of illness; **William L. Anderson,** senior engineering draftsman, land section, resigned May 18, to accept appointment in the Office of the Quartermaster General, Washington, D. C.

J. Harold Zoller of Cheyenne, Wyo., who graduated from the University of Wyoming in June, has been employed as engineering draftsman in the bridge office of the Wyoming Highway Department. Mr. Zoller, who was president of the student chapter of A.S.C.E., was offered seven engineering fellowships, and will continue his studies at Cornell.

R. C. Hoppe, city engineer for four years at Abilene, Tex., has been named city manager at Sweetwater. He will succeed **Roy Duckett,** who has been acting city manager since the resignation 20 months ago of **Sam H. Bothwell,** now city manager at Fort Worth.

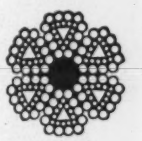
Warren S. Pletz has been probationally appointed junior civil engineer and assigned to duty in the design section, district office of the U. S. Engineers at Huntington, W. Va.

James E. Gibson, engineer and manager for the commissioners of public works operators of the Charleston, S. C., municipal waterworks, received the degree of doctor of science from the University of Arkansas on June 9. Mr. Gibson was graduated from that university in 1894. He has been an engineer for the Charleston waterworks since 1917. He designed and supervised construction of the Edisto River tunnel beneath the

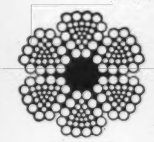
(*Continued on p.* 84)

"HERCULES" REG. U.S. PAT. OFF. RED-STRAND WIRE ROPE

In "HERCULES" there is a correct type and construction for every heavy duty requirement. Some of these are here illustrated, all of which can be furnished either Standard or Preformed.

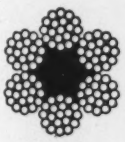


Style B

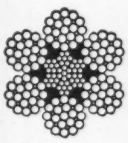


Style G

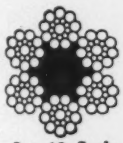
Flattened Strand



6 x 19 Filler Wire



6 x 19 Wire Rope Center



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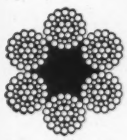

6 x 37 Type

Round Strand

If you will tell us how you use wire rope, we shall be glad to suggest the construction most suitable for your conditions.

There Is Extra Profit In Its Plus Value

Use "HERCULES" (Red-Strand) the next time you re-rope. You will soon discover the definite advantages of the Leschen manufacturing policies and methods, which leave nothing to chance. From the initial selection and tests of its materials, to the final inspection of the finished rope, each manufacturing detail is rigidly checked to assure long operating life.

Measure the extra value of "HERCULES" (Red-Strand) Wire Rope by the yardstick of performance. It will bring you extra profit, as well as help speed up your work. With wire rope, it pays to use the best.

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use Steam Operated

LIDGERWOOD CABLEWAYS

Where Electric Current is not available as for instance,

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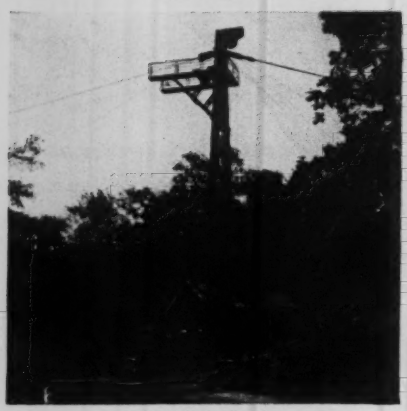

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But we build many
BIG ONES
Like this battery of SEVEN

EST. 1873

LIDGERWOOD MANUFACTURING COMPANY
ELIZABETH·N·J·

(*Continued from p. 82*)

Ashley River to give Charleston an adequate water supply.

W. D. Hines has been renamed superintendent of the water department of Drexel, N. C.

Col. Donald F. Pancoast, Lakewood, Ohio, chief engineer of the Ohio highway planning survey, on May 24 was appointed executive officer of the new Ohio State Guard by Adj. Gen. Whittier S. Bird. Col. Pancoast is a former commander of the 112th Engineer Regiment of the Ohio National Guard.

Joseph E. Herzog, assistant highway engineer for Mower County, Minn., has been appointed highway engineer for Steele Co. with headquarters at Owatanna. He succeeds **Raleigh W. Hosfield.**

Carman G. Payne has been appointed county engineer of Johnson County, Kan., with headquarters at Olathe. He fills the vacancy made by the resignation of **Leo Pearce.**

Ray L. Harrison has been appointed city engineer at Grand Island, Neb.

L. A. Henderson, of Charlotte, N. C., is supervisor in charge of construction of 64 mobilization buildings at Fort Bragg, N. C., contract for which recently was let to the V. P. Loftis Co. of Charlotte.

Ted C. Mayo, a civil engineer connected with PWA in Ft. Worth, Tex., for about five years, has been appointed chief sanitary engineer of the health department, Panama Canal Zone, with headquarters at Balboa. Mr. Mayo, a native of Vermont and a graduate of Massachusetts Institute of Technology, has been stationed in the Canal Zone about 18 months.

Major Werner C. Strecker, St. Louis, Mo. has been designated constructing quartermaster for the $33,500,000 fuse and detonator plant at Jacksonville, Ark.

Norman W. Perry, Sioux Falls, and **Dale C. Custer,** have accepted positions with General Electric Corp. at Erie, Pa. Perry and Custer received engineering degrees from South Dakota State School of Mines this spring.

William H. McFarlane of Jamestown, N. Y., former resident of Binghamton, N. Y. has been named construction engineer for Broome County with headquarters in Binghamton.

J. G. Conrath, assistant engineer with the Bethlehem (Pa.) Municipal Water Authority on the construction of Bethlehem's new $3,900,000 mountain water supply (*ENR*, July 4, 1940, p. 6), last month began new duties as water supply engineer with Caribbean Architect-Engineer. Mr. Conrath will be stationed in the New York City office and will work under the direction of **Gale Dixon,** who in turn reports to **John P. Hogan.** Previous to joining the Bethlehem water authority, Mr. Conrath spent two years with Bethlehem Steel and previous to that he was with the Lock Joint Pipe Co. working on the design of the water supply system for Cartagena, Colombia, S. A. Previous to that he was with the Pennsylvania R. R. and Gibbs & Hill, New York, working on the design and construction of the Pennsylvania's electrification system. He is a graduate of Lehigh University.

Major John C. Pritchard, former water commissioner and director of public utilities of the City of St. Louis, and for the past eight years a member of the firm of Russell & Axon, consulting engineers of St. Louis, has been called into active service with the zone constructing quartermaster, Omaha, Neb., effective June 24.

Sam E. Johnson, who has been acting director of the Idaho state highway bureau since the resignation of **C. P. Humphrey** April 1, last week was appointed director.

Porter J. Preston, Denver, Colo., formerly senior engineer in charge of the Colorado-Big Thompson project for the Bureau of Reclamation and recently retired from that position, has been appointed consulting engineer for extensions to the waterworks system at Oklahoma City, Okla. He plans to remain in private practice.

F. E. Liebetrau has been named city engineer and city commissioner of Roundup, Mont., to succeed **Fred Quinnell.**

Lt. Col. H. G. Thompson of Toronto has been promoted to the rank of colonel in the Canadian Army, and to the post of chief ordnance mechanical engineer.

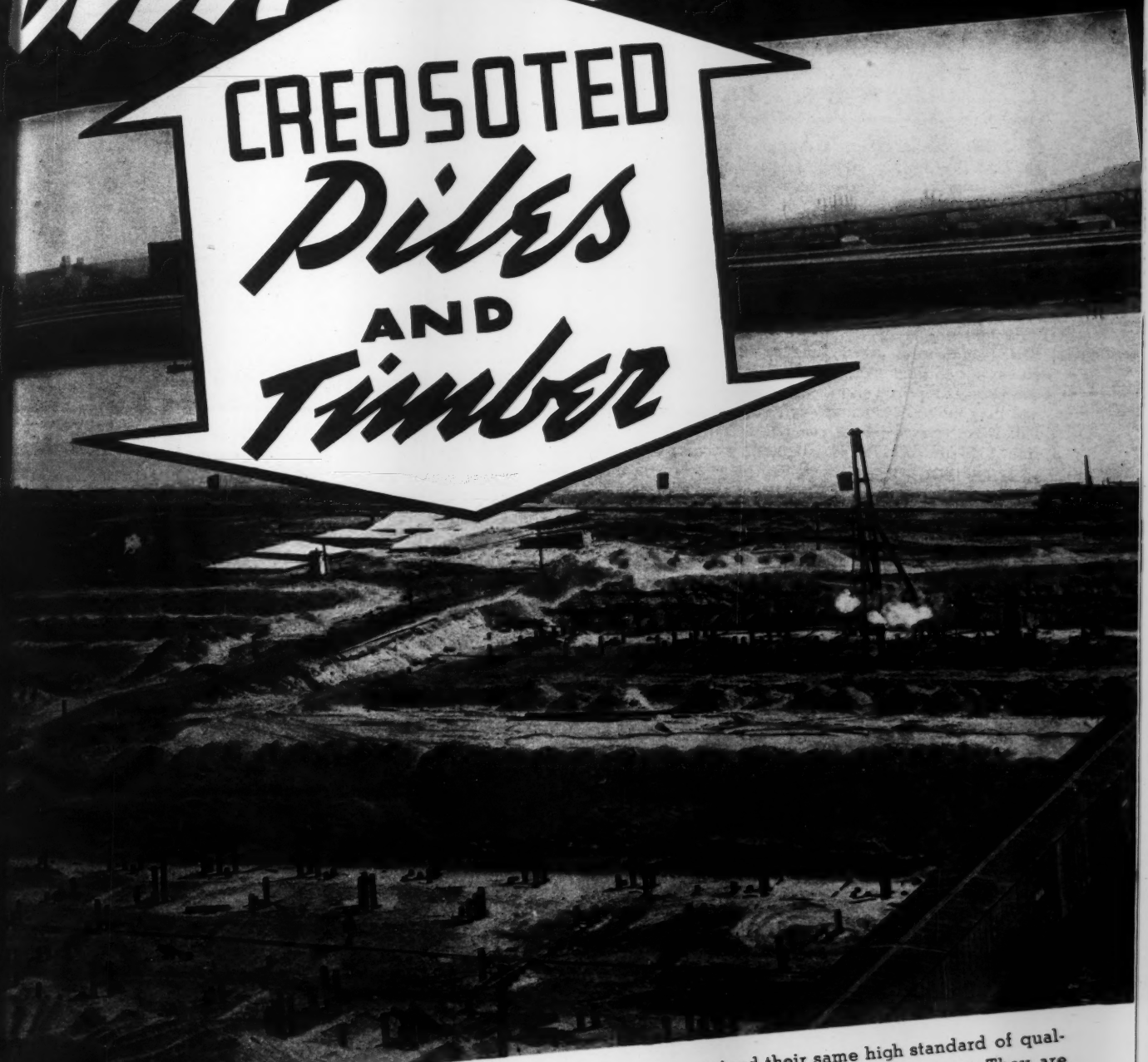
Lt. Col. R. A. MacFarlane, also of Toronto, has also been promoted to the rank of colonel, and appointed director of mechanization under the Master General of Ordnance.

Roy W. Sauer, with the Huntington, Va., district office of the U. S. Engineers for the past 10 years, has been transferred to the Vicksburg, Miss., office, as principal engineer, effective July 1. He is

(*Continued on p. 88*)

AmCreCo

CREOSOTED *Piles* AND *Timber*



MODERN construction projects should be protected against the menace of timber decay and natural deterioration. AmCreCo pressure treated piles, poles and timber give that protection with the additional advantage of economy, found in low first cost, reduced maintenance expense and long life. AmCreCo creosoted products have maintained their same high standard of quality for over thirty five years. They are today, as in the past, made of sound timber, treated with only time tested and proven preservatives. The reputation of AmCreCo pressure treated piles, poles and timber will always be guarded by this same strict policy. Their use is a definite guarantee of satisfaction. Information will be sent upon request.

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ADDRESS INQUIRIES TO CHICAGO, ILL., OR LOUISVILLE, KY.

CONTRACT UNIT PRICES

What contractors are bidding on different kinds of construction work

HIGHWAY WIDENING AND RESURFACING, INDIANA

OWNER: Indiana State Highway Commission, Indianapolis.
PROJECT: Concrete widening, surface treated bituminous retread pavement and resurfacing on stabilized material base, or concrete base, 6.390 miles E. Lincoln Ave., State Rd. 4. Runs from Rock Run Creek, Goshen, to State Highway 13, Elkhart, Elkhart County, Ind.

CONDITIONS: Contractor to furnish all materials and complete work by November 1, 1941. Rail and highway transportation facilities available. Wage rates minimums are: skilled labor, 75c. per hr.; semi-skilled, 60c.; and common, 55c.

BIDS: Bids were asked June 3, 1941 on the project, for either a stabilized material base or a concrete base. Only one bid was received on the stabilized material base, $152,219, and the contract was tentatively awarded to this bidder. Three bids were received for the concrete base construction, ranging from $166,611 to $175,180. Engineers estimate $164,233.

LIST OF BIDDERS:

1. Rieth-Riley Constr. Co., Goshen, Ind. (tentative award) (Stabilized material base) $152,219
2. Paul J. Messer Constr. Co., Chicago, Ill. (Concrete base) 166,611
3. Rieth-Riley Constr. Co., Goshen, Ind. (Concrete base) 168,903
4. Moellering Constr. Co., Fort Wayne, Ind. (Concrete base) 175,120

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Grade B special borrow	2,610 c. y.	$0.80	$0.50	$1.50
2. Spec. Cl. D conc., structures	66.8 c. y.	30.00	35.00	25.00
3. Cl. D concrete, structures	75.9 c. y.	30.00	30.00	24.00
4. Reinforcing steel, struct.	8,638 lb.	.06	.06	.05
5. Std. catch basins, type C-2 (hood)	3 ea.	100.00	125.00	135.00
6. Spec. 15-in. pipe catch basin	1 ea.	50.00	55.00	35.00
7. Std. 15-in. pipe catch basin	2 ea.	40.00	50.00	30.00
8. Final trimming and cleaning	6.39 mi.	400.00	400.00	400.00
9. Sodding (fertilized)	12,224 s. y.	.20	.20	.19
10. Seeding (fertilized)	31.5 ac.	15.00	15.00	15.00
11. Furn. seed and fertilizer	31.5 ac.	25.00	25.00	25.00
12. Riprap	20 s. y.	3.00	3.00	3.00
13. Paved side ditch	795 l. f.	.90	1.00	1.00
14. Concrete sidewalk	640 s. y.	2.50	3.00	1.80
15. Sidewalk removal	675 s. y.	.25	.50	.20
16. Concrete crosswalk, type B	35 s. y.	3.00	4.50	2.25
17. Crosswalk removal	6 s. y.	.50	3.00	.30
18. Pavement removal	586 s. y.	.50	.60	.35
19. Pavement surface removal	6,916 s. y.	.30	.40	.50
20. Flex. steel plate guard rail	916 l. f.	1.25	1.25	1.00
21. Guide posts, type A	61 ea.	2.00	1.50	1.75
22. Guide posts, type B	280 ea.	2.00	1.25	1.85
23. R.R. crossing signs, type A	2 ea.	40.00	50.00	70.00
24. Bench mark posts	2 ea.	10.00	15.00	20.00
25. Concrete header	16 l. f.	1.50	3.00	2.00
26. Aggregate for subsurface drains	20 c. y.	3.00	3.00	2.50
27. Manhole covers, adjust to grade	1 ea.	10.00	100.00	10.00
28. Vitrified clay pipe, 24-in.	54 l. f.	2.75	3.00	2.60
29. 12-in. corr. metal pipe	1,030 l. f.	1.10	1.25	1.15
30. 15-in. corr. metal pipe	230 l. f.	1.45	1.40	1.40
31. 18-in. corr. metal pipe	78 l. f.	1.80	2.00	1.75
32. 24-in. corr. metal pipe	10 l. f.	2.50	3.00	2.55
33. 30-in. RC, CI or CM pipe	80 l. f.	3.25	3.50	3.20
34. 36-in. RC, CI or CM pipe	54 l. f.	4.00	4.50	4.00
35. 12-in. pipe	12 l. f.	1.40	1.30	1.10
36. 15-in. pipe	444 l. f.	1.50	1.50	1.25
37. 18-in. pipe	166 l. f.	1.80	2.00	1.75
38. 6-in. sewer pipe	16 l. f.	1.00	1.00	.65
39. 8-in. sewer pipe	108 l. f.	1.20	1.20	.75
40. 12-in. sewer pipe	2 l. f.	2.00	1.50	1.00
41. 15-in. VC or CC drain tile	30 l. f.	1.50	1.80	1.05
42. 24-in. bit. coat. CM or bit. coat. CM pipe with paved invert	60 l. f.	3.00	4.00	3.10
43. 54-in., as above	80 l. f.	9.00	12.00	12.50
44. Bit. coat. perf. CM, VC sewer, CC sewer, or perf. VC sew. pipe, subsurf. drains, 6-in.	100 l. f.	.90	1.20	.80
45. Perf. CM, VC sewer, CC sewer or perf. VC sewer pipe for subsurf. drains, 6-in.	70 l. f.	.90	1.20	.80
46. Perf. corr. met. pipe, subsurf. dr., 6-in.	30 l. f.	1.10	1.20	1.00
47. Compacted aggregate	150 ton	2.50	3.00	2.25
48. Concrete pavement	5,404 s. y.	2.40	2.30	1.95
49. Rein. steel, pavement	306 lb.	.10	.06	.05
50. Aggreg. for bit. surf. treat.	1,880 ton	2.45	3.00	2.50
51. Covering aggr., bit. surf. treatment	471 ton	2.50	3.00	2.50
52. Bitum. matl. for surf. and seal (EA, LA or T)	50,137 gal.	.10	.12	.10
53. Bitum. matl. for prime (LA or T)	12,534 gal.	.10	.12	.10
54. Aggregate, bitum. retread, Cl. A	9,150 ton	2.45	[illegible]	2.70
55. Cov. aggr. for bitum. retread	627 ton	2.50	[illegible]	2.50
56. Bit. matl. for bit. retread, 1st, 2nd and 3rd coats (EA, LA or T)	97,140 gal.	.10	.14	.10
57. Reconstructed concrete base	200 c. y.	15.00	25.00	15.00
58. Excavation, peat	2,806 c. y.	.30	.50	.25
59. Excavation, common	52,260 c. y.	.35*	.40*	.30*
60. Special borrow	862 c. y.	.50*	.50*	.40*
61. Overhaul, one balance	7,761 c. y.	.10*	.10	.05
62. Overhaul, two balances	2,711 c. y.	.15*	.20*	.12*
63. Bit. matl. for prime for bit. retread (LA or T)	6,268 gal.	.10*	.15*	.10*
64. Concrete base	32,775 s. y.	1.65*	1.65*	1.90*
65. Excavation, common	53,859 c. y.	.35†	.....	.....
66. Excavation, special borrow	577 c. y.	.50†	.....	.....
67. Overhaul, one balance	8,035 c. y.	.10†	.....	.....
68. Overhaul, two balances	2,316 c. y.	.15†	.....	.....
69. Bit. matl. for prime for bit. retread (LA or T)	21,945 gal.	.10†	.....	.....
70. Finished mixture for stabil. matl. base	14,585 ton	2.50†	.....	.....
71. Aggregate for shoulder drains	20 ton	2.50	.....	.....
72. Bit. stab. mixt. (LA or T) for pub. road, priv. drive, and mailbox appr.	1,532 ton	4.00	No unit	.....
73. Bit. stab. mixt. (LA or T) pub. road appr.	462 ton	4.00	No unit	4.50
74. Chem. stabil. mixt., priv. drive, etc.	1,070 ton	3.00	No unit	3.50

* Bituminous retread on concrete base. † Bitum. retread on stabilized material base.

HIGHWAYS, WYOMING

OWNER: Wyoming Highway Department, Cheyenne.
PROJECT: Grading, drainage, construction of treated timber bridge, asphaltic base treatment, and other appurtenant work on 15.635 miles of Cheyenne-Pine Bluffs Road, Laramie County, Wyo. Graded width 34 and 40 ft. Base 5-3½-5-in.

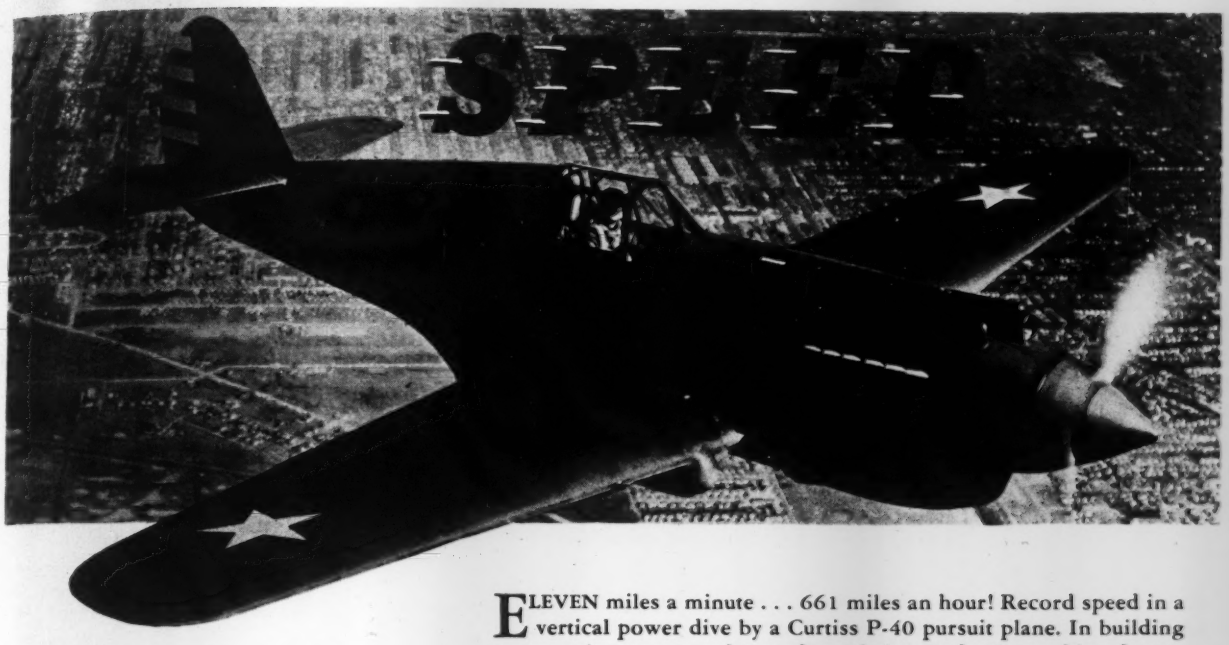
CONDITIONS: Contractor to furnish all materials and complete work in 150 working days. Rail and highway transportation facilities available. Approximately one-half of project to be constructed under traffic. Wage rates are: skilled labor, 80¢ to $1.12½ per hr.; semi-skilled, 65¢; and common, 55c.

BIDS: Nine bids were received May 6, 1941, ranging from the contract low of $160,273 to $189,197.

LIST OF BIDDERS:

1. Blanchard Bros., Cheyenne, Wyo. (contract) $160,273
2. H. W. Read, Cheyenne, Wyo 164,677
3. Ed. H. Honnen, Cheyenne, Wyo 168,722
4. Inland Constr. Co,. Omaha, Nebr 171,851
5. Northwest Engineering Co., Rapid City, S. D 173,000
6. Leach Bros., Cheyenne, Wyo 175,103
7. Taggart Constr. Co., Cody, Wyo 175,526
8. Big Horn Constr Co., Sheridan, Wyo 187,556
9. J. M. Keahey, Buffalo, Wyo 189,197

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Excavation	552,000 c. y.	$0.14	$0.14	$0.166
2. Watering	6,080 M gal.	2.25	2.25	1.50
3. Sheepsfoot roller operation	2,920 hr.	2.25	2.25	2.25
4. Pneumatic tire roller operation	340 hr.	2.50	2.50	2.50
5. Overhaul	203,000 c. y. sta.	.015	.015	.015
6. Cubic yard mile haul	124,000 c. y. mi.	.118	.15	.12
7. Excav.; pipe culverts	400 c. y.	.80	.80	.50
8. 18-in. corr. metal pipe	120 l. f.	1.50	1.50	1.70
9. 24-in. corr. metal pipe	2,768 l. f.	2.30	2.25	2.30
10. 36-in. corr. metal pipe	258 l. f.	4.40	4.45	4.60
11. 42-in. corr. metal pipe	212 l. f.	4.85	4.75	5.50
12. Relaying pipe	1,100 l. f.	1.00	1.00	.80
13. Mechanical tamping	525 hr.	2.00	2.00	2.25
14. Class I riprap	165 c. y.	5.00	5.00	4.00
15 Grouted riprap	25 c. y.	8.00	8.00	6.00
16. Portable snow fence	608 l. f.	.70	.70	.50
17. Remove, reset snow fence	560 l. f.	.40	.40	.40
18. Right-of-way markers	50 ea.	8.00	8.00	5.00
19. Rein. conc. project markers	3 ea.	15.00	20.00	15.00
20. Remove existing structures	L. S.	400.00	400.00	180.00
21. Standard R/W fence	110,000 l. f.	.06	.065	.06
22. End panels	85 ea.	7.50	7.50	7.00
23. Brace panels	120 ea.	5.00	5.00	4.00
24. Treated timber	35.239 M bm.	122.00	120.00	120.00
25. Treated timber piling	1,152 l. f.	1.40	1.20	1.20
26. Metal plate guard rail	255 l. f.	1.50	1.75	2.00
27. Base treatment, MC-1	148,000 gal.	.08	.08	.075
28. Roller operation, smooth steel type	115 hr.	2.50	2.50	3.00
29. Remove, reset water tank	L. S.	5.00	5.00	30.00
30. Standard R/W fence	52,500 l. f.	.06	.065	.06
31. End panels	50 ea.	7.50	7.50	7.00
32. Brace panels	70 ea.	5.00	5.00	4.00
33. Remove, reset R/W fence	1,900 l. f.	.03	.03	.03
34. Remove, reset telephone line	3.9 mi.	35.00	35.00	100.00
35. 30-ft. telephone poles (matl.)	15 ea.	12.00	15.00	15.00
36. Telephone wire (matl.)	65 rod	.06	.045	.15



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661 MILES AN HOUR

IN CONSTRUCTION:

68 DAYS FOR AN 8¾-ACRE PROPELLER PLANT

ELEVEN miles a minute . . . 661 miles an hour! Record speed in a vertical power dive by a Curtiss P-40 pursuit plane. In building construction, too, speed records are being made. 68 working days to complete 8¾-acre Curtiss-Wright propeller plant, Caldwell, N. J.! Factory in operation 3 months after first shovelful of earth was turned.

Maximum Speed—Minimum Cost

Lone Star Cement and 'Incor' 24-Hour Cement speed national defense—in factories, highways and bridges, Army and Navy construction. With 'Incor', pour concrete one day, strip forms the next. That means top speed, at lower cost of concrete in place.

Where time is a factor, use 'Incor'*—elsewhere, use Lone Star. Both cements produce quality concrete—proved by outstanding performance. Write for copy of "Cutting Concrete Costs." Lone Star Cement Corporation, Room 2289, 342 Madison Avenue, New York.

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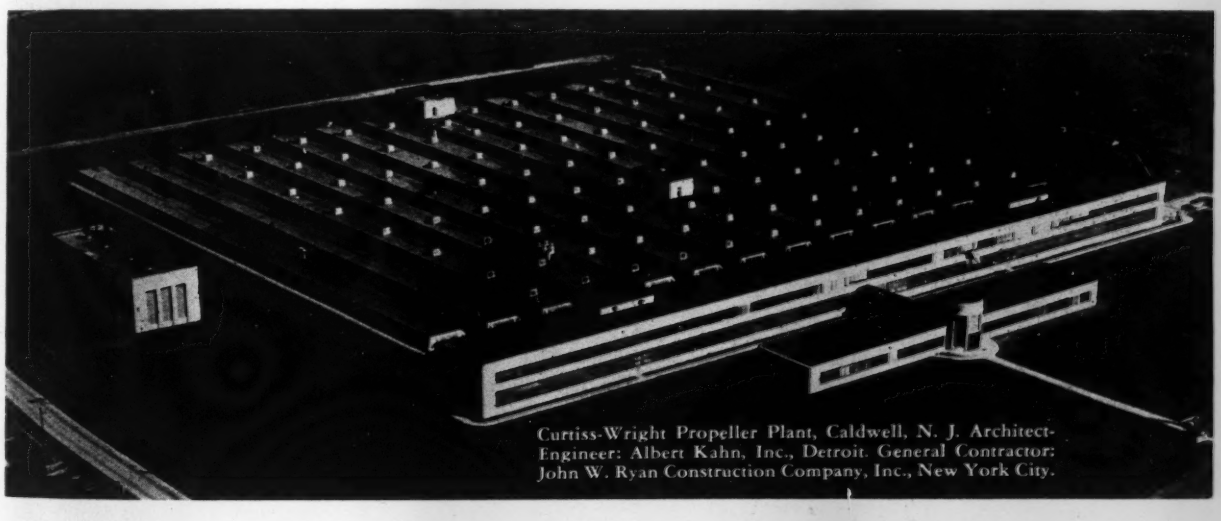

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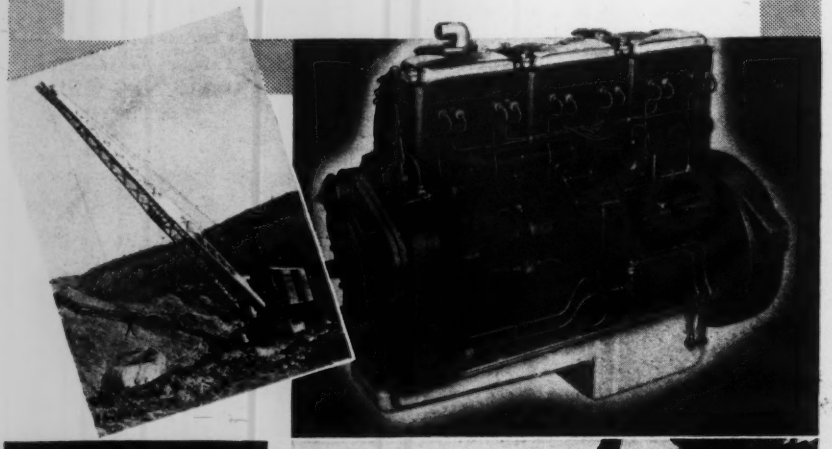

Above Right: Model HB-600 Cummins Dependable Diesel. 150 hp. at 1800 rpm. Other models from 33 to 325 hp.

Above Left: Kingston Contracting Co., Girardville, Pa., recently replaced the gasoline engine in a 1 3/4-yard Osgood shovel with a supercharged Cummins Diesel.

Right: This Autocar truck, owned by Frank Kopla, Hartford, Conn., has been repowered with a Cummins Diesel.

(*Continued from p. 84*)

now senior engineer of the Huntington staff, helped design the Kanawha River and Gallipolis dam, and supervised flood control work in the district.

James A. McGeady has resigned as district WPA supervisor at Durham, N. C., to accept a position with the USHA at Wilmington, N. C., where defense housing projects are under way. Mr. McGeady had held the WPA post at Durham for more than five years. His successor has not been named, but his duties are being carried on for the present by **William A. Sutton,** office engineer.

David P. Clifford has just been reappointed superintendent of the water department at Dunn, N. C., by the Dunn city commissioners. **Troy Goodwin** also has been retained as assistant superintendent. In addition to his duties as water department superintendent, Mr. Clifford also serves as city engineer and building inspector.

Grady P. Harrell, of Shannon, N. C., president of the North Carolina Society of Surveyors, was appointed a member of the North Carolina State Board of Registration for Engineers and Land Surveyors June 19. Harrell was appointed by Governor J. M. Broughton of North Carolina and will fill out the unexpired term of **N. S. Millican,** who resigned recently.

C. Blake Jackson, contractor of Toronto, has been named by Munitions Minister C. D. Howe as deputy priorities officer and assistant director general of the priorities branch of the Canadian Department of Munitions and Supply. Mr. Jackson is to head the construction control division, and so will administer the control regulations noted in *ENR* May 29, p. 848.

Rufus H. Nims, of Raleigh, N. C., has been appointed chief architectural engineer for NYA in North Carolina. Mr. Nims graduated from N. C. State College in 1934 with a degree in architectural engineering, and since 1935 has been associated with Thomas W. Cooper, Raleigh architect.

Paul Rice has become construction engineer at the new shell-loading plant at Burlington, Iowa. A civil engineering graduate of Iowa State college in 1935, he was formerly a resident engineer with the Charles De Leuw Co., Chicago.

George W. Peterson, former supervising engineer on the Loup River Public Power District of Columbus, Neb., has been ordered to Alaska to spend a year

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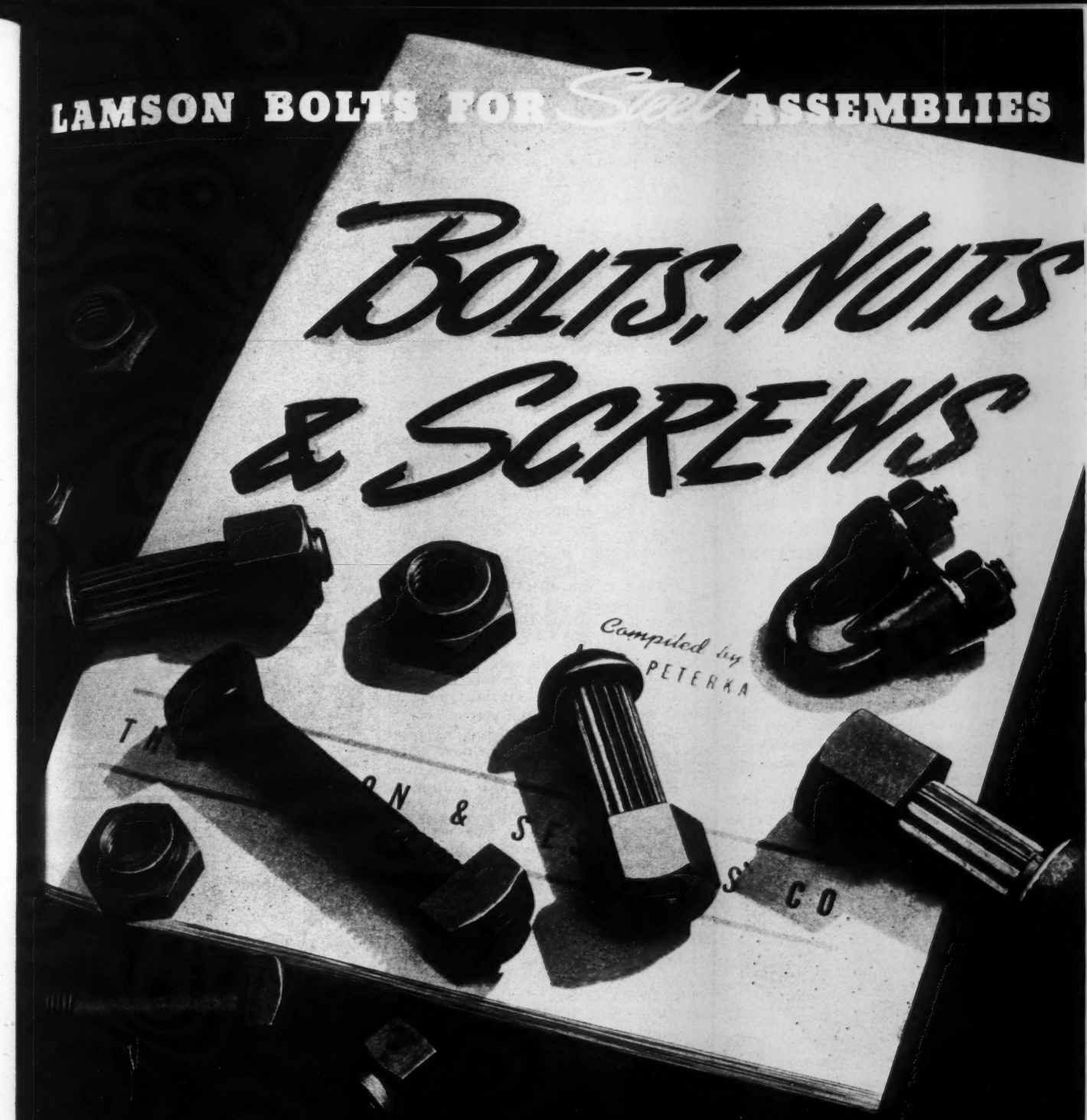
BOLTS, NUTS & SCREWS



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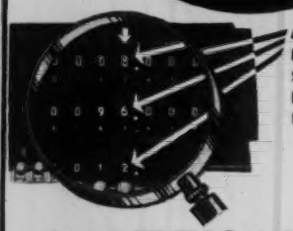

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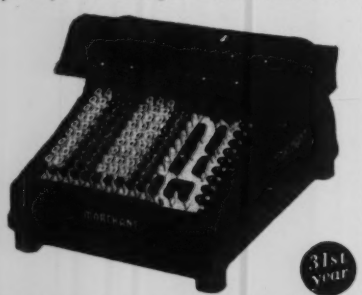

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as civilian civil engineer at the military airport at Anchorage.

F. R. Buechner, formerly city manager of Piqua, Ohio, has been appointed city manager of Superior, Wis.

Robert Kellum has been appointed county engineer of Redwood County, Minn. His headquarters is Redwood Falls. Mr. Kellum, who has been an assistant in the county engineer's office, will serve until **Richard Cook,** regular county engineer, is relieved of military duties.

D. B. Gumensky, designing engineer with the Metropolitan Water District of southern California during the construction period, has resigned to accept a position with the Hawaiian Dredging Co. and associated contractors on construction work at Pearl Harbor, Hawaii. Gumensky was a pilot with the Imperial Russian air forces during the first World War, subsequently completed an engineering course with the University of California, and has been with the Metropolitan Water District for the past 12 years.

Wendell W. Ralphe, resident engineer at Nimrod Dam, in Arkansas, went to the Blue Mountain Dam project June 8. Work at Nimrod Dam is now 75 percent complete. **William Papenheimer,** assistant resident engineer at Nimrod, will succeed Mr. Ralphe at that project.

Everette Roberts, M. B. Gilbrough and **LuVerne Kirby,** recent graduate civil engineers from the South Dakota State School of Mines, have accepted positions in the bridge department of the South Dakota State Highway Commission.

Ed Bruns, of Hecla, S. D., has been named county highway superintendent of Brown County, S. D. He succeeds **Wayne Van Winkle** who resigned to accept a position as coordinator for the James River Valley REA.

Stanley L. Baker of Des Moines, Iowa, formerly city engineer at Newton, Iowa, has accepted a civil service commission with the U. S. Army Engineers at Seattle, and will be assistant engineer on airport construction projects.

J. A. McCartney, superintendent of construction of the Pittsburgh Railways Co., has retired after 47 years of service. Mr. McCartney held positions of division engineer and assistant engineer until 1920, when he was promoted to superintendent.

H. Max Hunter, formerly connected with the city engineer's office at Fort Collins,

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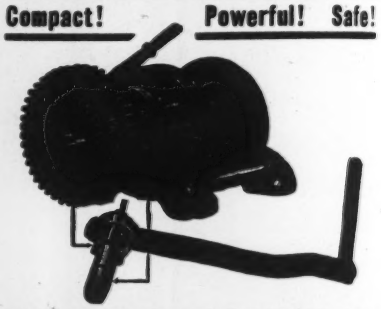

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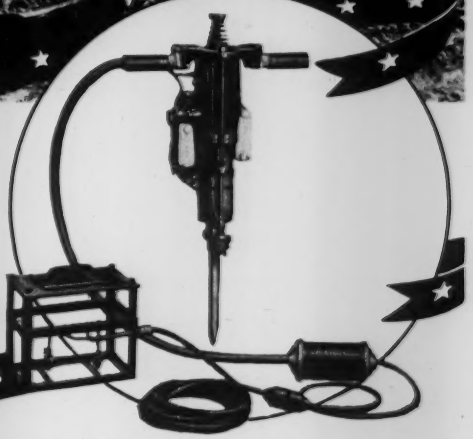

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This photograph shows a carload of BARCO Hammers being prepared for shipment to a single purchaser These hammers are part of a much larger order, significant testimony to the high regard in which these modern construction tools are held.

To offset part of your steadily increasing costs of doing business, look into the many economies made possible by BARCO Portable Gasoline Hammers. First of all, BARCO's may be added to your hammer equipment at low investment cost. Then, because they are portable and lightweight, your men can use them on many smaller or inaccessible jobs where the savings of power hammer operations were never possible before. And in addition, cost records will show that operating expenses hit new low costs per unit of work performed.

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Colo., has been appointed to the recently created post of road supervisor for Larimer County, Colo.

Frederick H. Dechant, member of the engineering firm of William H. Dechant & Sons, Reading, Pa., has been called into service with the United States Navy and reported for duty at the Brooklyn Navy Yard in June. He is an engineer officer with the Bureau of Yards & Docks, and has the rank of commander. Commander Dechant served in a similar capacity during the first World War.

Ivan Lauren, civil engineer, a recent graduate of John Brown University, has accepted a position in the engineering department of Boeing Aircraft Corp. at Seattle, Wash.

Arthur Togers has been named city engineer of Hiawatha, Kan., succeeding **W. H. Sunderland,** who will move to Topeka, Kan., to work for the state water conservation board.

George A. Elias, formerly assistant engineer in the Philadelphia district office of the Pennsylvania department of health, has been appointed by the secretary of health as district engineer in charge of that office. He succeeds former District Engineer **Harry M. Freeburn,** who resigned to accept the position of chief engineer of the Philadelphia Suburban Water Co.

Charles Robbins, superintendent of the water department at Denton, N. C., has resigned to accept a position with the water and sewage department at Camp Davis, new anti-aircraft firing range constructed at Holly Ridge, N. C., in connection with the national defense program. **Stokes Tysinger,** of Denton, engineer with North Carolina State Highway and Public Works Commission, has been appointed to succeed Robbins as water department superintendent at Denton.

Harold Slater, of Wooster, Ohio, assistant county engineer of Wayne County, has reported at Ft. Hayes, Columbus, for army service as a first lieutenant in the field artillery.

John M. Hewitt, former assistant city engineer of Zanesville, Ohio, who recently was called for army service, has been assigned to the Army Engineer Replacement Training Center at Ft. Leonard Wood, Mo. After serving in the city engineer's office Mr. Wood became a supervisor in charge of WPA projects. More recently he had been connected with the state highway department office at Marietta.

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Factors responsible for the trend to STEEL WATER LINES...

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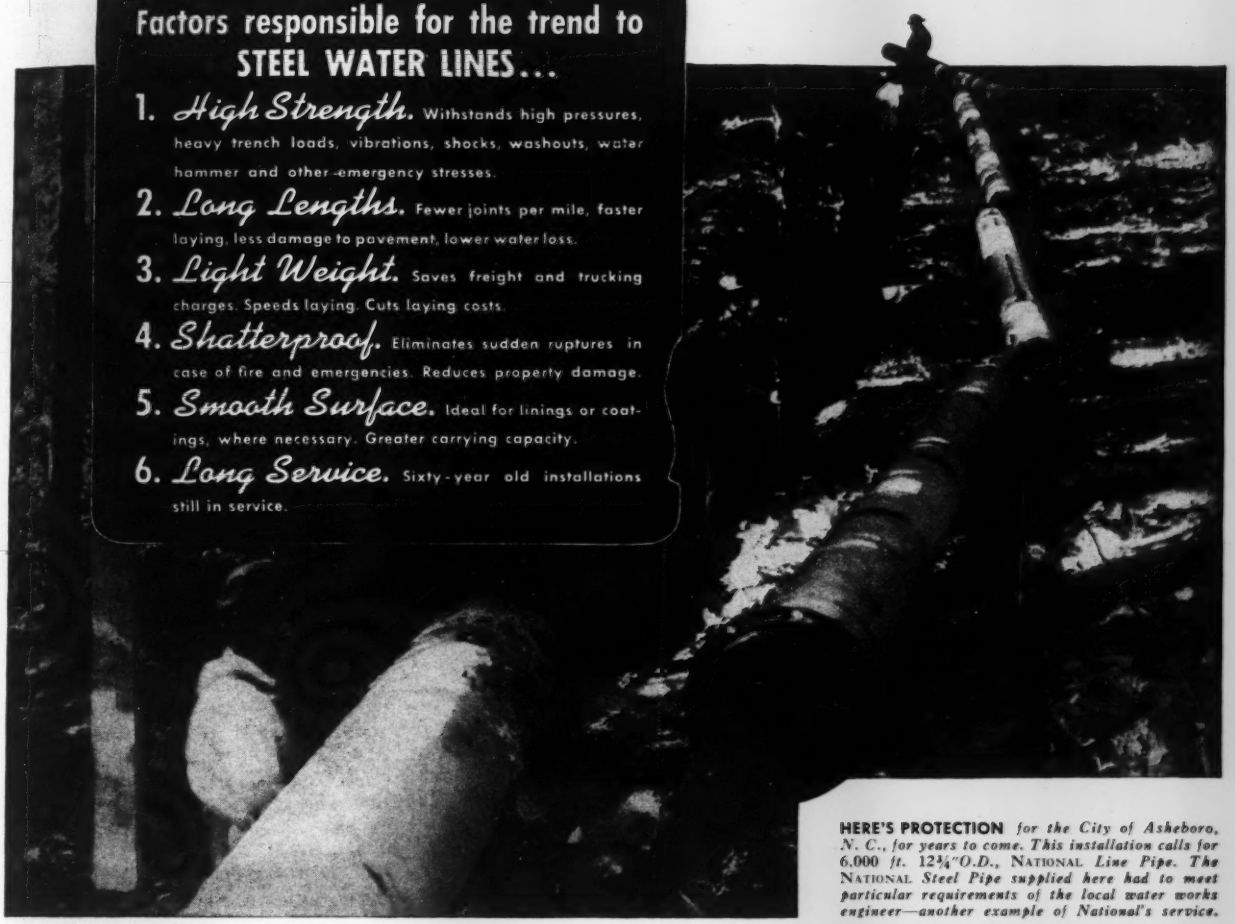

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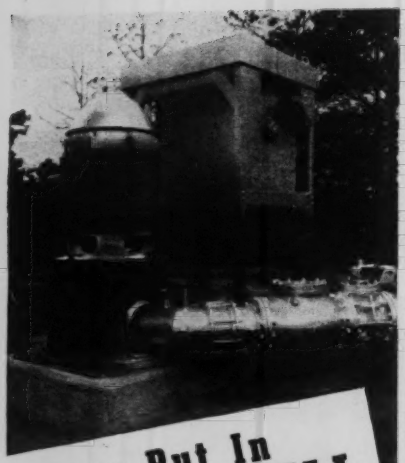

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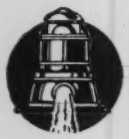

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MEETINGS

AMERICAN SOCIETY OF CIVIL ENGINEERS, Annual Convention, U. S. Grant Hotel, San Diego, Calif., July 23-25.

PHOTOELASTICITY, Summer Short Course, Massachusetts Institute of Technology, Cambridge, Mass., July 28-Aug. 8.

NATIONAL INSTITUTE FOR TRAFFIC SAFETY TRAINING, 4th annual, University of California, Berkeley, Calif., Aug. 4-16.

PAN-AMERICAN HIGHWAY CONGRESS, fourth exposition, National Stadium, Mexico City, D. F., Sept. 15-24.

AMERICAN ASSOCIATION OF STATE HIGHWAY OFFICIALS, Detroit, Mich. Sept. 29-Oct. 2.

REGIONAL AND LOCAL MEETINGS

MISSISSIPPI SOCIETY OF PROFESSIONAL ENGINEERS, Buena Vista Hotel, Biloxi, Miss., July 18-19.

PUBLIC HEALTH ENGINEERING, short course, water, sewage and camp sanitation—Massachusetts Institute of Technology, Cambridge, Mass., June 16-July 25.

WESTERN PENNSYLVANIA SECTION, AMERICAN WATER WORKS ASSOCIATION, annual convention, Erie, Pa., Aug. 7-9.

PENNSYLVANIA SEWAGE WORKS ASSOCIATION, State College, Pa., Sept. 3-5.

NORTHERN MICHIGAN COUNTY ROAD COMMISSIONERS ASSOCIATION, annual meeting, Cheboygan, Mich., Sept. 18-19.

NEW YORK STATE ASSOCIATION OF TOWN HIGHWAY SUPERINTENDENTS, Rochester, N. Y., Sept. 18-20.

ELECTIONS AND ACTIVITIES

ALEX C. BURR, of Jamestown, N. D., has been re-elected president of the North Dakota Society of Professional Engineers. Other officers are: James Kennedy of Grand Forks, vice president; H. G. Hanson of Bismarck, secretary-treasurer.

G. S. ATKINSON, JR., of Fayetteville, N. C., has been elected president of the North Carolina State College student branch of the Associated General Contractors of America. R. E. Porter of Charlotte, N. C., was named vice-president, H. W. Humphreys of Roanoke Rapids, secretary-treasurer, and D. L. Struthers of Wilmington, sergeant-at-arms.

A. E. ADAMI, of Butte, Mont., has been elected president of the Montana Society of Engineers. Other officers named for the ensuing year are B. J. Ornburn, of Helena, first vice president; William A. O'Kelly, of Butte, second vice president; Gerard J. Pesman, of Montana State College, and Ben Chestnut, of Anaconda, trustees. Renato A. Bianchi, of Butte, was re-elected secretary-treasurer.

AN HONORARY DEGREE of doctor of laws has been conferred on C. J. MacKenzie, dean of engineering at the University of Saskatchewan, in the 1941 convocation exercises at Dalhousie University, Halifax, N. S. Dean MacKenzie was born at St. Stephen, N. B. in 1888, receiving the degree of bachelor of engineering from Dalhousie in 1909, and master of civil engineering from Harvard Engineering School, Boston, in 1914. He served as an army engineer in the Canadian Expeditionary Force in the first World War and was awarded the military cross. He is acting president of the National Research Council, of Canada, and current president of the Engineering Institute of Canada.

ROGER V. TERRY, Hilton Village, Va., chief hydraulic engineer with the Newport News Shipbuilding & Drydock Co., has received an honorary degree of doctor of engineering from the North Carolina State College at Raleigh, N. C.

THE UTAH CHAPTER of the American Society of Civil Engineers at a recent meeting appointed a committee to formulate plans for civilian protection in wartime. The committee is composed of R. K. Brown of Salt Lake City, superintendent of the State Building Commission, who was named chairman of the committee, and serving with Mr. Brown will be C. E. Painter and Henry G. Tempest of Salt Lake City, and Ora Bundy and O. C. Lockhart of Ogden.

ON THE 50TH ANNIVERSARY of his graduation from Pennsylvania Military College, Maj. **Joseph W. Shirley**, of Baltimore, was honored with the degree of doctor of civil engineering at the institute's commencement, held June 12. Major Shirley was graduated in 1891 and in 1912 his alma mater bestowed upon him an honorary degree of master of civil engineering.

DEAN SAMUEL S. STEINBER of the University of Maryland College of Engineering, has been appointed by Governor O'Conor of Maryland to the board of registration for professional engineers and land surveyors. Before becoming dean, Mr. Steinber was professor of civil engineering at the university. He has served as engineer for the New York Public Service Commission and as assistant engineer of the Tela Railroad of Honduras, Costa Rica.

MEMBERS OF THE UTAH state planning and water conservation board, meeting at Cheyenne on June 11, elected L. C.

"With GULF LUBRICANTS and fuels we move more dirt and rock at less cost"

says this contractor

"By following the Gulf engineer's recommendations, our equipment operates at peak efficiency day in and day out... in January as well as in June"

Ralph Myers Construction Company, Salem, Indiana, is relocating 6.79 miles of the William Penn Highway near Pittsburgh, Pennsylvania. Gulf lubricants and fuels help keep this modern earth-moving equipment operating at top speed without unnecessary delays.

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You, too, will find it *real economy* to use Gulf quality lubricants and fuels on your next contract. Call in a Gulf engineer today and ask him to recommend the right lubricants and fuels for your equipment. His one big aim is to help speed your work. No matter where your job is located, you are sure of quick delivery of Gulf quality products through more than 1200 warehouses located in 30 states from Maine to New Mexico. Write or phone your nearest Gulf office.

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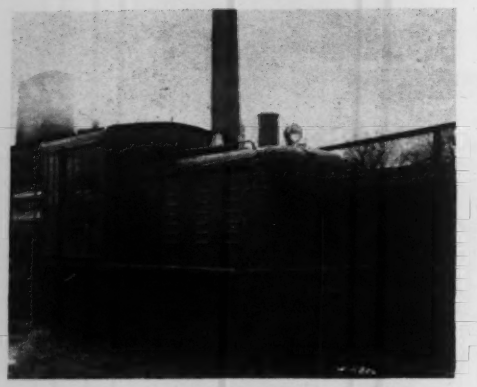

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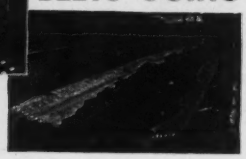
KEEP YOUR CONVEYOR BELTS GOING



FLEXCO H D RIP PLATES are used in repairing rips and patching conveyor belts. Their use saves expensive replacements and extended shutdowns.

● Avoid shutdowns and lengthen the life of your conveyor belts and bucket elevator belts by using Flexco belt fasteners. Thousands of companies have stepped up the performance of conveyor lines and cut costs by using Flexco methods.

FLEXCO H D BELT FASTENERS make a strong, tight butt joint with long life. Recessed plates embed in belt, compress belt ends and prevent ply separation. Six sizes in steel and alloys.

Bulletin F-100 shows exactly how to make tight butt joints in conveyor belts with Flexco. Also illustrates step by step the latest practice in repairing rips and putting in patches.

FLEXIBLE STEEL LACING CO.
4656 Lexington St., Chicago

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FLEXCO HD BELT FASTENERS

Sold by supply houses everywhere

Bishop, state engineer, as board president to succeed Governor Nels H. Smith, who resigned the position due to pressure of other official duties. N. B. Bennett, first assistant state engineer, was named secretary and engineer for the board. He succeeds George O. Houser, department of commerce and industry secretary. L. F. Thornton of Thermopolis was reelected vice-president. The board approved a contract with the U. S. Geological Survey to continue during the coming year an underground water survey of the Pine Bluffs, Wyo. area.

ABOUT 150 MEMBERS and guests of the Engineers Society of Pennsylvania attended the organization's annual outing at the West Shore Country Club, near Harrisburg, June 5. Joseph R. Farrell was general chairman of this special event which included a dinner and entertainment in the evening. The annual golf tourney was won by Richard Johnson.

FRED DOUTT, of Canton, N. C., was installed as president of the Engineers Club of Western North Carolina at a banquet meeting in Asheville on June 7. He succeeds R. B. Fuller of Asheville. Other officers installed were: Raymond F. Bennett of Brevard, N. C., vice president; John P. Dosier of Enka, N. C., secretary; and R. G. Thyse of Asheville, treasurer. W. J. Parks, Jr., R. B. Fuller and J. Heykoop were installed as directors.

W. P. SPENCE of Sanford, N. C., was elected president of the North Carolina Water Works Operators Association at the annual three-day school for waterworks operators at North Carolina State College, Raleigh, June 10-13. He succeeds L. I. Lassiter of Wilmington. Other officers elected were: J. O. Davidson of Charlotte, vice president; H. D. Fesperman, of Albemarle, secretary-treasurer, and W. F. McKimmon of Raleigh, member of the board of examiners.

THE ENGINEERS' CLUB OF Minneapolis, Minn., at a recent meeting elected new officers for the ensuing year as follows: George C. Priester, president; Don R. Loper, vice president. New members of the board of directors elected for a three-year term are: Ralph Lowe, George Wade, and H. W. Meyer. A. F. Mellen, engineer at the Fridley municipal filtration plant, is secretary of the club.

HENRY J. BRUNNIER, San Francisco consulting engineer, has been awarded the Marston Medal for distinguished engineering service by Iowa State College. Mr. Brunnier has just celebrated his 35th year of engineering practice. He is a member of the San Francisco Bay Bridge Consulting Engineers Board.

THE PARKERSBURG CHAPTER of the West Virginia Society of Professional

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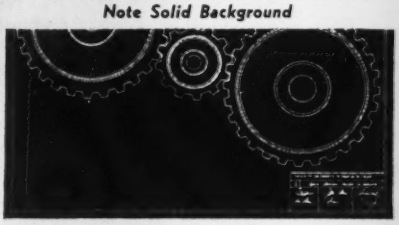
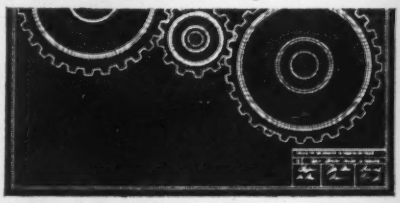


VELLUM DRAWING
Note Mottled Background



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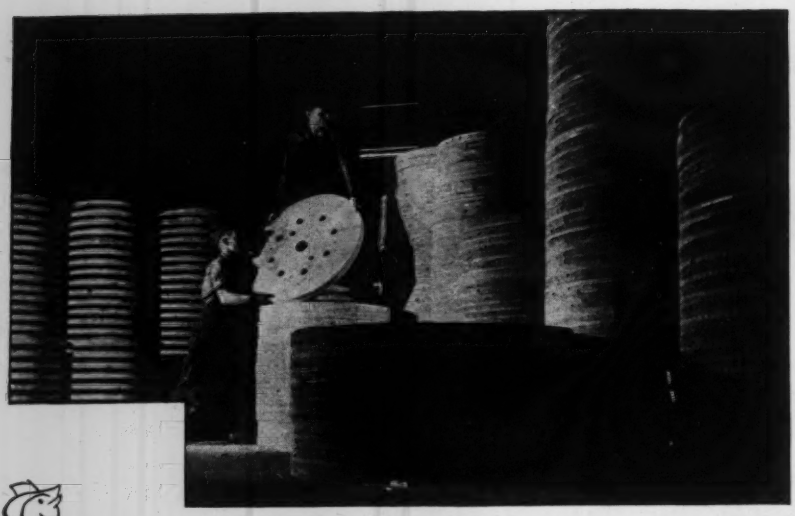

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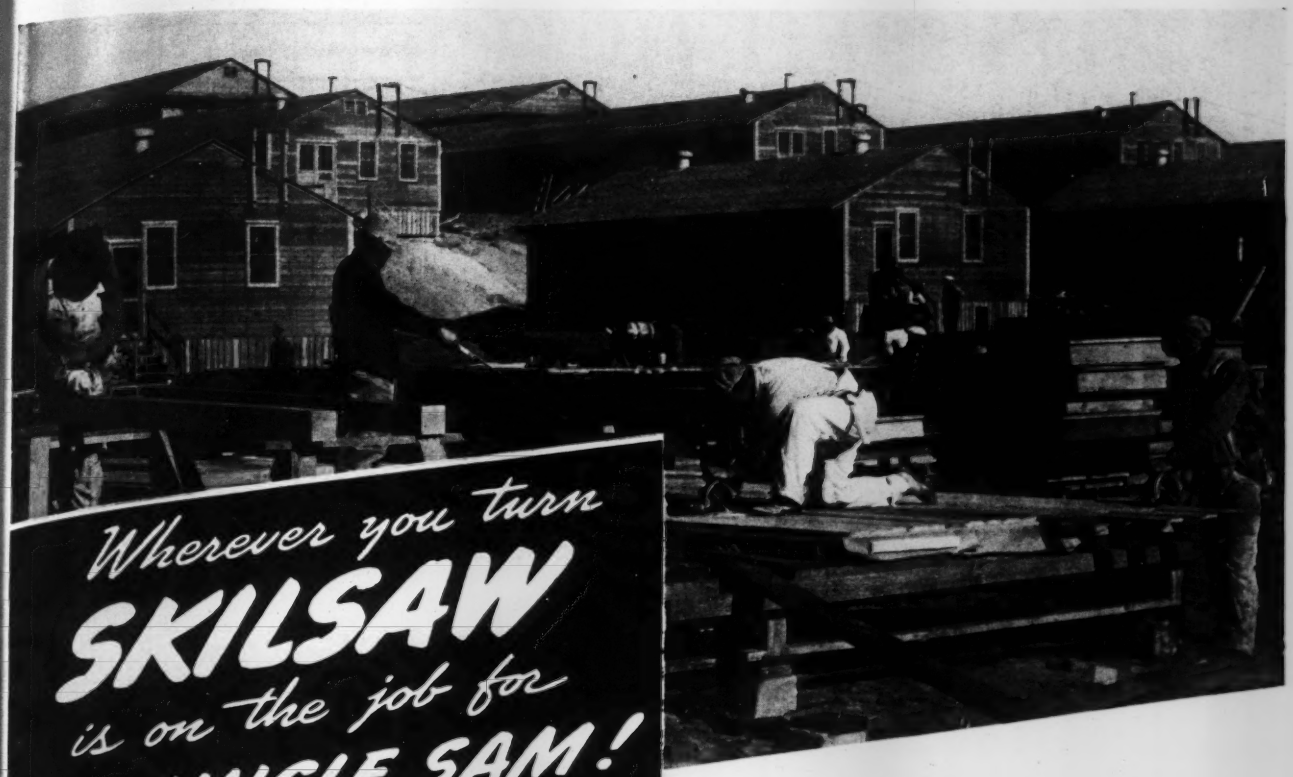
Engineers recently elected T. L. Stamp of the Parkersburg Rig and Reel Co. as president of the organization. He succeeds Robb Gover, formerly district engineer of the West Virginia State Road Commission who was recently transferred to the Charleston, W. Va. office. T. A. Thompson of the road commission was named vice-president to succeed F. L. Bellegia, who has been called to active military service. After the election of officers, a vote of thanks was given to Capt. W. M. Hall for the placement of Engineering News-Record in the Carnegie Library.

THE NATIONAL CONSTRUCTION COUNCIL of Canada, which is composed of 16 trade and professional associations serving the designing, contracting, building material manufacturing and supply, and labor branches of the construction industry, elected the following officers at their recent annual meeting: A. S. Mathers, Royal Architectural Institute of Canada, was elected president; John W. Gooch, Canadian Construction Association, first vice-president; E. Ingles, Trade and Labor Congress, second vice-president; Maj. L. L. Anthes, Canadian Manufacturers Association, honorary treasurer. Besides the officers, the following compose the executive committee: E. P. Muntz and J. M. R. Fairbairn, Engineering Institute; Maj. G. M. Thomson, Canadian Paint, Oil and Varnish Association, and Gordon M. West and Burwell R. Coon, of the Royal Architectural Institute.

THE MONTANA SECTION of the American Water Works Association, at its annual meeting last month in Missoula, elected the following officers: chairman, H. B. Foote, Helena; vice-chairman, F. F. Palmer, Forsyth; trustees, S. R. Young, Hardin; A. E. Heath, of Billings; and Wade Plummer was reelected to the board of trustees.

R. C. WALLACE of Queen's University, Kingston, Ont., was admitted to honorary membership in the Engineering Institute of Canada at a special meeting of the Kingston branch of the institute, held June 14. Mr. Wallace is a geologist of note, and principal at the university. He was formerly on the staff of the University of Manitoba, deputy minister of mines for Manitoba, and president of the University of Alberta. He has just served a term as president of the Royal Society of Canada.

THE WASHINGTON STATE ASSOCIATION of County Engineers, at its convention late last month, held at Ellensburg, elected J. H. Redmond of Whitman county as president; W. A. Bugge, Jefferson county, vice president, and Harry Sisler, King county, secretary-treasurer.



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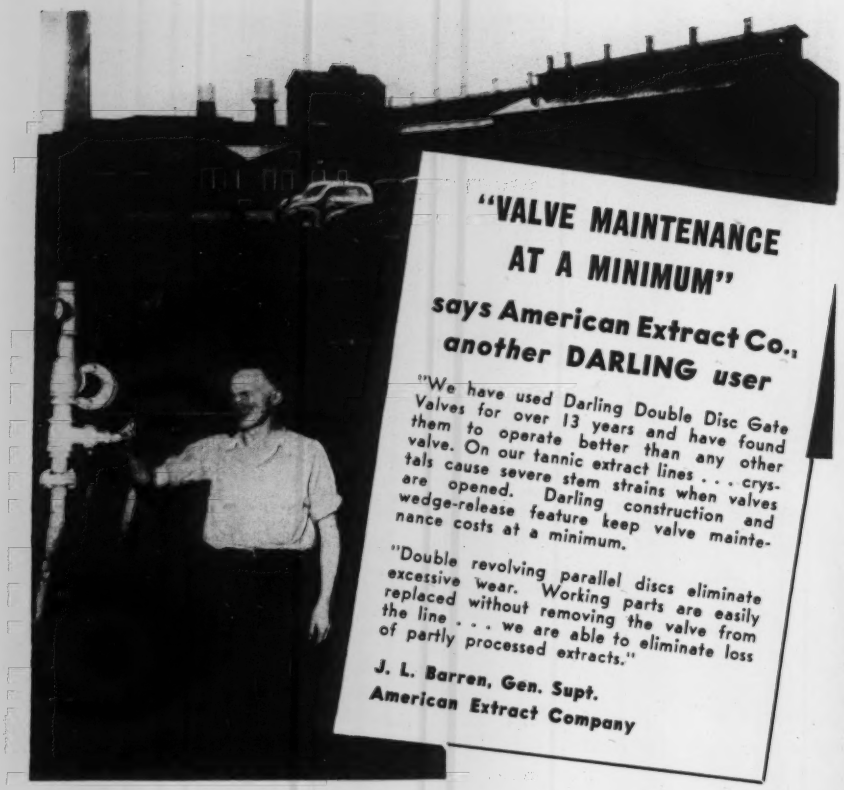
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"Double revolving parallel discs eliminate excessive wear. Working parts are easily replaced without removing the valve from the line . . . we are able to eliminate loss of partly processed extracts."
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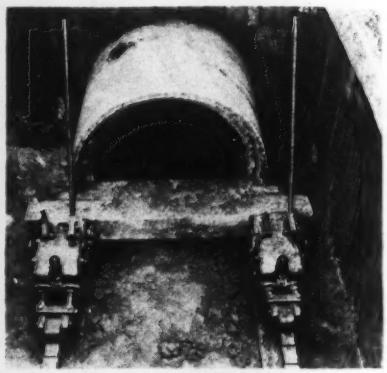
New Aids to the Constructor

Tunnel Lining

A new tunnel liner plate design is claimed to have the advantage of simplicity of assembly and resulting speed in erection in the tunnel, especially where the ground in which the tunnel is to be built is clay which may be mined by hand or power knives. Provision may be made to temporarily brace the arch ribs without resting upon the clay trench. After the liner plates are complete for a convenient length of tunnel, the reinforcing rods and concrete arch may be placed at once to avoid squeeze of the clay.—*George Perrine, 347 Madison Ave., New York City.*



Hydraulic Pipe Pushers

The Greenlee line of hydraulic pushers was developed to install pipe underground without the expense of digging long trenches, breaking through concrete, backfilling and tamping. Only a short trench is necessary to accommodate the pusher with one section of pipe. One or two men can develop the pressure required by pumping the handles. The 75-ton unit shown above was designed to handle large drainage ducts and other pipe larger than 4 in. Pipe up to 6 in. is usually pushed with a closed end but larger sizes are pushed open and the soil removed through the pipe by means of scoops and sewer rods. —*Greenlee Tool Co., Rockford, Ill.*

Midget Welder

For use in welding light gage metal, castings and drive shafts, general maintenance and light production work, a new Flexarc welder is announced by Westinghouse. Sensitive adjustment of the welding current over a range from 20 to 140 amperes is provided by 15 steps with correctly proportioned increments. The unit is very compact, measuring about 15x12x20 in. This outfit,

It Pays To Specify Flame-Priming on New Equipment and Structural Steel

because it prepares steel for better, faster, longer-lasting paint jobs . . .

OXY-ACETYLENE flame-priming of steel to remove loose scale, rust, and moisture before painting can, in many cases, completely eliminate sand-blasting. At the same time, this process does away with the necessity for chemical treatment of the steel prior to painting.

Flame-priming can be applied to structures of practically any size. Irregularity of shape, recesses, rivets, or other "hard-to-get-at" parts offer no obstacle. This process is easy to learn, easy to use, and requires only a small amount of equipment.

Shown above is an operator using an Oxweld flame-priming blowpipe to prepare a large tank for a perfect paint job. The acetylene is from three manifolded Prest-O-Lite cylinders.

How It Works—To use flame-priming, a heating head is passed quite rapidly over the surface to be cleaned. The quick surface heat causes the loose scale to break away, and at the same time drives out surface moisture. The priming operation is closely followed by wire-brushing, and the paint is then applied while the metal is still warm and dry. As a result, the paint flows on faster, bonds tighter, and dries quicker. And because loose scale, rust, and surface moisture have been eliminated, subsequent paint flaking is avoided.

and Linde can help you use it!

If you would like to know more about flame-priming, get in touch with Linde! Whether it's welding, cutting, flame-hardening, flame-softening, descaling, or hard-facing—if it is a "flame" process—*it pays to ask Linde!*

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Toto Swings on the Rope She Can Trust

"I might fall for Mr. Gargantua . . . but not for a second-grade rope," says the Belle of Ringling Bros. Barnum & Bailey Circus. Toto's swing rope, like all 200 miles of rope used in, on, or around the Big Top, is made by Plymouth.

Taken from Plymouth Rope Advertising Campaign in Time Magazine.

A SAFETY MESSAGE TO INDUSTRIAL BUYERS AND SELLERS OF ROPE . . .

from William H. Curtis, Supt. of Canvas, Ringling Bros. Circus

"In my 51 years of circus life," Mr. Curtis says, "I've used Plymouth rope almost exclusively. And I'll tell you why:

"SAFETY FIRST is more than a slogan with us. With eight to twelve thousand mothers, dads and kids filling our tent twice a day, we can't take chances on anything but the best rope.

"YOU MIGHT TELL those fellows who buy rope for industrial use that we replace all 200 miles of our circus rope every year. Yes sir, folks who come to the Big Top can depend on us—and Plymouth Rope."

THANK YOU, MR. CURTIS. One reason why we are the world's largest maker of cordage is because *informed* rope users, like you, specify the "Rope You Can Trust."

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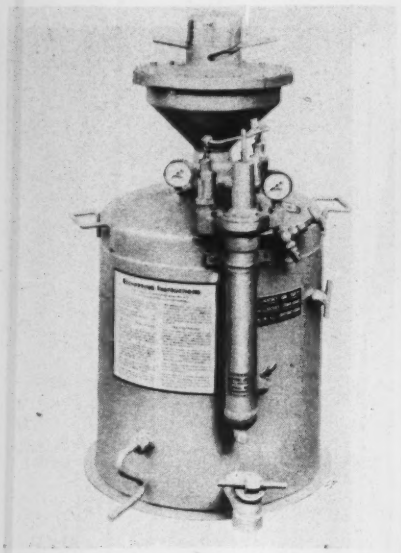
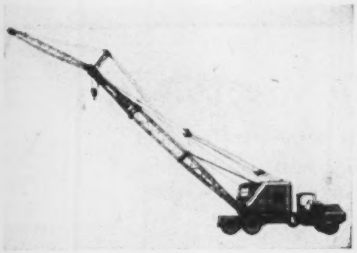
known as the Midget Marvel WT-1, is an a-c welder and comes completely equipped. Power consumption cost is said to average 5 cents per hour—*Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.*



Portable Acetylene Generator

A new portable acetylene generator for use in oxy-acetylene welding and cutting has been announced by Linde. This generator, known as the Oxweld MP-10, will deliver 30 cu.ft. of acetylene per hour and is suitable for welding metal up to 3/8 in. thick, and for cutting steel up to 5 in. thick. It is designed for maximum portability from a standpoint of weight and height and can readily be moved about the shop or away from the shop for outside jobs. The generator can be recharged speedily and is simple and easy to operate.—*Linde Air Products Co., Unit of Union Carbide & Carbon Corp., 30 E. 42nd St., New York City.*



Truck Crane

Owing to its special lattice type all-welded construction, the 80 ft. boom of the P&H Model 255-A is not only light in weight but possesses such strength and stability that it can handle a 30-ft. jib, thus giving a total boom length of 110 ft. A powered planetary

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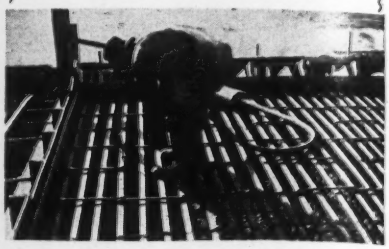

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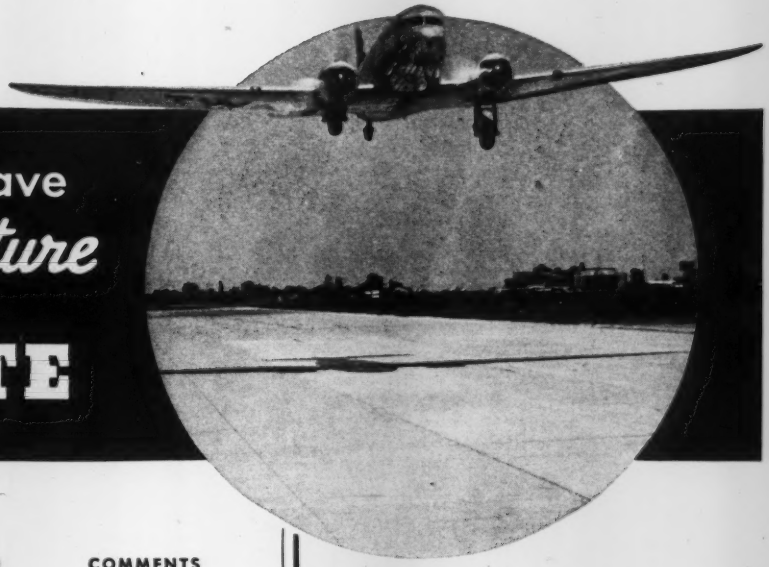

AIRPORT AND CONCRETE YARDAGE	WHEN CONSTRUCTED	COMMENTS
Floyd Bennett Field—311,200 sq. yds.	1929-30 (2 runways and aprons) 1935-36-40 (additions)	Heavy traffic. Excellent condition. Maintenance cost negligible.
Rhode Island State Airport—220,000sq.yds.	1935-41	Very small expense for maintenance. Excellent condition. Includes 41,800 sq. yds. under contract.
Grand Central Air Terminal, Glendale, Cal.—39,000 sq. yds.	1928-29	Excellent condition. Little maintenance needed.
Lunken Field, Cincinnati Municipal Airport—140,000 sq. yds.	1932	After 9 years of traffic and a flood 20 ft. deep, pavement in excellent condition.
Wayne County Airport, Detroit—242,000 sq. yds.	1929-30—1940-41	Performance of 193,000 sq. yds. built in 1929-30 led to use of concrete for 49,000 sq. yds. extension in 1940-41.
Indianapolis Municipal Airport—145,000 sq. yds.	1930-36-37-40	Original concrete runways and aprons progressively extended—with the same type of pavement. More concrete planned.
Wold-Chamberlain Field, Mun. Airport of Minneapolis—415,000 sq. yds.	1935-36-40-41	174,000 sq. yds. in 1936. 241,000 built or under construction, 1939 to date. Additional 278,000 planned.
Toledo Municipal Airport—164,000 sq. yds.	1940-41	Rebuilt with concrete to replace a short-lived surface which originally cost about as much as concrete.
Hamilton Field, San Rafael, Cal.—338,000 sq. yds.	1934 (aprons) 1939 (runways)	Excellent performance of aprons built in 1934 dictated choice of concrete for new runways.
Barksdale Field, Shreveport, La.—292,000 sq. yds.	1932-1940	175,000 sq. yds. placed in 1932 has given good service—117,000 sq. yds. more in 1940.

Look at Concrete's Record at Typical Airports

Which type of pavement for airports has the best record for standing up under ever-increasing traffic?

Which has served the longest periods with lowest maintenance and least annual cost?

Which has provided greatest safety in all weather, greatest strength in emergencies?

Service records of leading airports say: CONCRETE! Records like these explain why 50 fields now have concrete runways; why concrete is the choice for over 15,000,000 sq. yds. of airport pavement, including that now being rushed to completion at civil and military airports.

Insure years of safe, economical, all-weather operations by specifying concrete for runways, aprons, turn-arounds and taxiways of main airports. Design and construction data on request.

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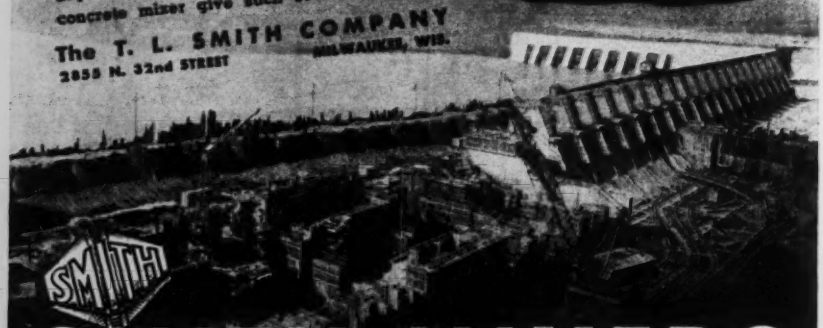
101 BATCHES of Concrete per Hour!

WATTS BAR DAM—The Smith Tilting Mixers at Watts Bar Dam are living up to their excellent reputation established at Boulder Dam, Tygart Valley, Marshall-Ford and other big projects. With a 90 second mixing period, the three Smith 56-S Tilters actually produced concrete at the rate of 101 batches per hour — the maximum theoretical capacity of the plant — and these dependable mixers have kept up this tremendous production day after day. Again we ask you — could any other concrete mixer give such service?

Battery of three Smith 2-yd. Front-End Charging Mixers at Watts Bar Dam.

The T. L. SMITH COMPANY
2855 N. 32nd STREET MILWAUKEE, WIS.



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GOODALL AIR HOSE
"SUBWAY BRAND"
A Goodall "Standard of Quality" Product

Wrapped duck construction, "Balanced Built" to insure equal life and service for tube, carcass and cover. Widely used in large mining, contracting and industrial installations for high pressure work. Sizes ½" to 1¼", inclusive; maximum lengths of 50 feet.

"MINE KING"
Another "Standard of Quality" item. A flexible hose for hard service on long lines. Tough, extra heavy brown cover; genuine oil-resisting tube; new Goodall "White-Tite" friction between cords. Sizes: ½" and ¾" in continuous lengths up to 500 feet; 1", up to 250 feet. All triple cord construction.

"'37" BRAND
A molded and braided air hose with tough wear-resisting black cover. Economically priced, but guaranteed to give long, faithful service. Strong, durable, flexible. Sizes ⅜" to 1½", inclusive. Maximum lengths of 500 feet.

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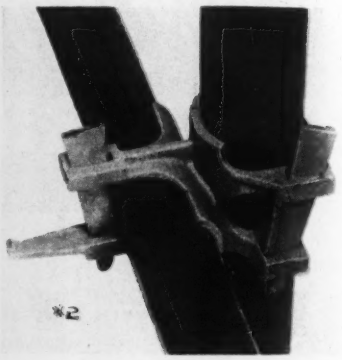
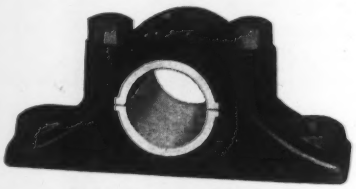
lowering device on the main hoist line and the planetary boom hoist provides greater craning flexibility and a constant control over movements of the crane boom. Mounted on a P&H Mack truck chassis this crane is equipped with hydraulic control for smooth responsive movements. — *Harnischfeger Corp., Milwaukee, Wis.*



Tubular Scaffold Coupling

The new Quick Lock coupling shown above enables anyone requiring tubular scaffolding to erect a structure of special characteristics to meet the requirements of the job and have the material fully salvagable at the end. Standard pipe can be used with no processing required other than threading of the pipe for the end connectors. The Quick Lock coupling provides maximum flexibility for holding scaffolding members at the proper angles for any part of the structure. Jaws are hinged, so that couplings may readily be applied at any point in the scaffolding or staging. Full information from—*Dravo Corp., National Department, 324 Penn Ave., Pittsburgh, Pa.*



Journal Bearings

A new and improved line of solid and split journal bearings, carried in stock and neatly cased and labeled for prompt delivery, has been announced by Jeffrey. Of accurate dimensions with modern rounded lines and smooth gun metal finish, these bearings have machined bases, faced ends, and babbitted bores broached to a smooth hard surface.—*The Jeffrey Mfg. Co., Columbus, Ohio.*

Window Protection

Constructors engaged in blasting can learn something about property protec-

Building *Wax Lake* Bridge *before the canal is dug!*

THIS unique railroad bridge construction job at Calumet, Louisiana, is being handled in reverse of the usual procedure.

The 1340-ft. railroad bridge is being built across a level stretch of dry land. Later when the bridge is completed, a flood canal will be dug under the structure. This was obviously the practical and economical method of handling the project.

Wax Lake Bridge will serve the Texas and New Orleans Railroad Co. The canal, a part of the Morganza Floodway, will carry Mississippi flood waters to the Gulf of Mexico.

This bridge construction is another example of Bethlehem's ability to carry out efficiently any type of steel construction project in any locality.

Contractors: McWilliams Dredging Co.

Engineers: Modjeski and Masters.
J. F. Coleman Engineering Co.

BETHLEHEM STEEL

BETHLEHEM STEEL COMPANY

General Contractor: The John F. Casey Co.

Carey Elastite ASPHALT PLANK PROTECTS

Bituminous Products Co., applicators of Carey Waterproofing and Elastite Planking.

IMPORTANT PITTSBURGH STREET IMPROVEMENT

IN Pittsburgh's $2,750,000 Water Street improvement, CAREY Elastite Asphalt Plank was laid beneath the street car rails on all overhead passages. The planking was laid on top of membrane waterproofing and covered with hot asphalt, thereby providing dependable protection for the waterproofing.

CAREY Elastite Asphalt Plank was selected for this important service because of its extreme toughness; its resistance to wear and rot and its negligible water absorption.

Engineers and others interested in the protection of waterproofing membranes should investigate the advantages of CAREY Elastite Asphalt Plank—Write Dept. 30.

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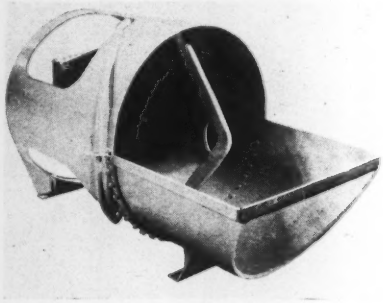
tion from the experience of the British in bombed areas. Among the materials suggested by the Ministry of Home Security, Air Raid Precautions Department, is the use of thick, tough, or reinforced paper applied with flour paste or acacia mucilage rendered slightly tacky by the addition of 5 percent glycerine, to prevent glass from flying into small fragments. Although this procedure cannot be relied upon to prevent breakage entirely, it may help to decrease it. Transparent wrapping materials are also employed and may be applied to the window with a good clear gum to which 15 percent of glycerine has been added. However, this adhesive is not suitable for cellulose acetate film. Further information from—*Glycerine Producers Association, 11 W. 42nd St., New York City.*



Concrete Bucket

A concrete bucket of the roller gate type has been developed which will receive a concrete charge either in upright position or lying down. This bucket, known as the Hi-Lo charge model, has a receiving hood and skids as illustrated above. These attachments permit laying the bucket down to receive its full rated load from a truck mixer. When lifted, the bucket assumes its normal upright position for discharge. The Hi-Lo bucket is available in 1, 1½ and 2 cu.yd. sizes. The Hi-Lo attachments by which a standard Blaw-Knox roller gate concrete bucket may be converted into a Hi-Lo charge model are also available for these sizes. Full information on this and other concrete buckets is contained in the newly issued Blaw-Knox Catalog No. 1816.—*Blaw-Knox Co., Pittsburgh, Pa.*

Bridge Crane

For large, heavy-capacity cranes of the type used for power houses and other moderate services requiring eight bridge track wheels, a novel crane end tie has been developed which is made of one heavy rolled steel plate that is first cut to shape and then bent to form a box section. Bending is done "cold." Into the box section are welded reinforcing diaphragms to effect the rigidity

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K&M *"Century"* Pipe available in 18-foot lengths, sizes 6" and 8" class 150...

...28% fewer joints!

FOR the first time, lightweight asbestos-cement pipe is available in long 18-foot lengths. This is an exclusive development of Keasbey & Mattison Co., makers of "Century" Pipe, and it provides you with a pipe that cuts 113 joints out of every mile of line.

The new 18-foot lengths, available in both 6" and 8" sizes, class 150, are quickly and easily handled without winches or other mechanical equipment. The installation time you save speeds up pipe laying and cuts costs. Because of "Century" Pipe's light weight, no additional man-power is required to handle the 18-foot lengths.

Particularly on long stretches of line you will find this new development a means of saving substantially on the time and cost of a project.

"Century" Asbestos-Cement Pipe is well known for its maintenance-free service under extreme conditions. It never tuberculates or corrodes. Its interior stays lastingly smooth, keeping down pumping cost. Its "Century" Flexible Couplings provide tight joints and are easy to install. Write Dept. 1017 for free booklet, "Mains without Maintenance."

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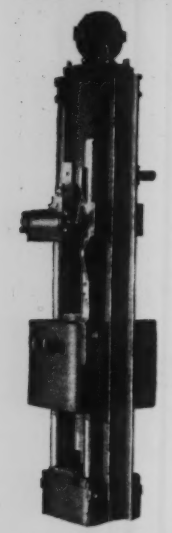
PILE HAMMERS



Getting approval year after year for such a long span of years speaks pretty well for this pile driver. It is a simple and thoroughly dependable machine that has rapid, regular, and continuous action — it drives any kind of pile — wood, concrete, or steel. Operates at a medium steam pressure and delivers a moderate frequency of low velocity blows from a relatively heavy ram.

Later VULCAN Types

- With such sound design and construction as characterizes the single-acting hammer it was but logical for our engineers to follow this first hammer basically in developing more modern types.
- SUPER-VULCAN Differential-Acting Closed Type Steam Pile Hammers, 1800—3000—5000—8000—to permit under-water work.
- SUPER-VULCAN Differential-Acting Open Type Pile Hammers, 18c—30c—50c—80c—use 25 to 35 per cent less steam per blow—give twice the number of blows per minute.
- VULCAN Pile Extractors for pulling sheet steel, wood, concrete, H-beam, and pipe piles. Sizes 200, 400, 800.

Write for details

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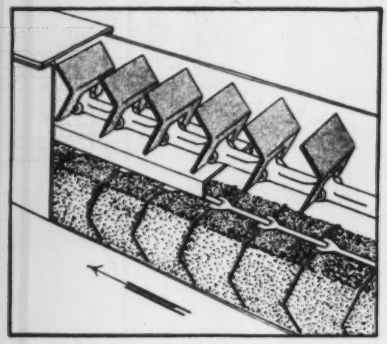
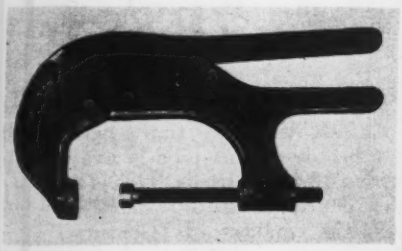
Chicago Illinois

required. This end tie construction is known as a "spring type" since it has sufficient give or spring to allow all wheels to bear properly on the track at all times, despite runway irregularities.—*The Cleveland Crane & Engineering Co., Wickliffe, Ohio.*



Bulk Conveying System

Bulk-Flo, a distinctly new and different power-operated conveyor system for the positive and continuous conveying of flowable granular, crushed, ground or pulverized materials of a non-corrosive, non-abrasive nature has been developed in capacities up to 140 tons per hour. The conveying medium employs a specially designed chain to which solid peak-top flights are rigidly attached at every pitch. These divide the material in the conveyor duct into a continuous series of batches which are moved positively whether there be full or only a partial load. These units may follow almost any desired path from horizontal to vertical and curvilinear.—*Link-Belt Co., 307 N. Michigan Ave., Chicago.*



Clamp

A new clamp, the "Klampacto," combines the deep throat of the standard clamp with the tremendous holding pressure of a toggle movement. The clamp is available in three models with a 5, 6 and 10 in. jaw.—*Knu-Vise, Inc., 16841 Hamilton Ave., Detroit, Mich.*

Plastic T-Square

Of special interest to engineers is the new Escolite T-square. The head of this outfit is made of black laminated Bakelite composition $\frac{1}{8}$ in. thick and the

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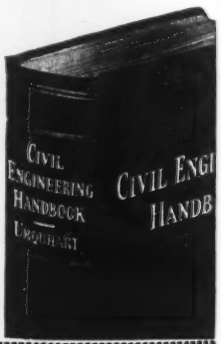

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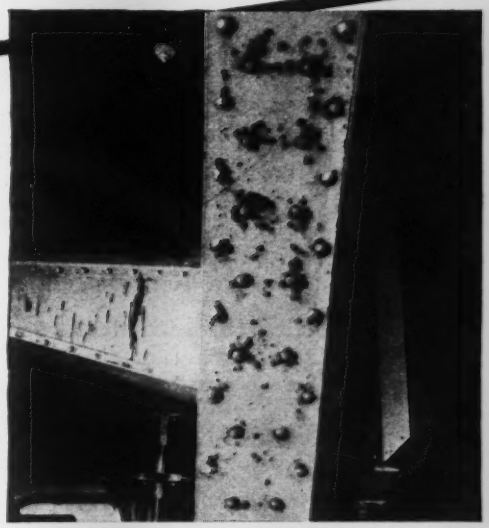
Don't Paint ANOTHER STRUCTURE UNTIL IT HAS BEEN PROPERLY RECONDITIONED BY AIRCO *Flame Cleaning*

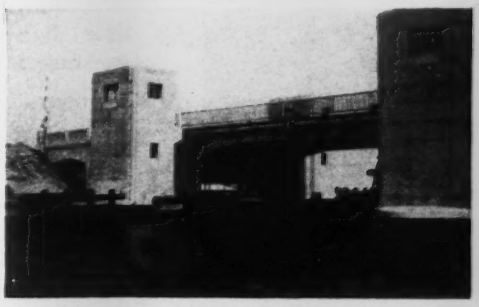
These instructions might well come from the "brass hats" in any number of contracting firms. For, the executives of many such companies have already solved their metal painting problems by preparing surfaces with the Airco Flame Cleaning Process before repainting. And wise advice this would be, because this economical process is the most effective method yet devised to prepare metal surfaces for long lasting paint jobs.

Utilizing a high temperature flame, Airco Flame Cleaning removes rust and scale, and dehydrates as it cleans; it leaves the metal surface dry and warm, conducive to a lasting paint job. This process is highly flexible, size or shape of the object to be cleaned make no difference. The apparatus with which it is applied is light, standard, portable and easy to operate.

Members of Air Reduction's Applied Engineering Department are available to assist in the proper application of the process so that it will be most effective wherever used. Further information will be gladly given upon request.



Rust conditions such as this are common—yet paint which will protect against corrosion cannot last long when applied to the surface in its present condition.



Spanning a salt water inlet, this bridge is subject to harsh exposure. Because it was flame cleaned prior to repainting, the present paint job will outlast its first many times.

Air Reduction

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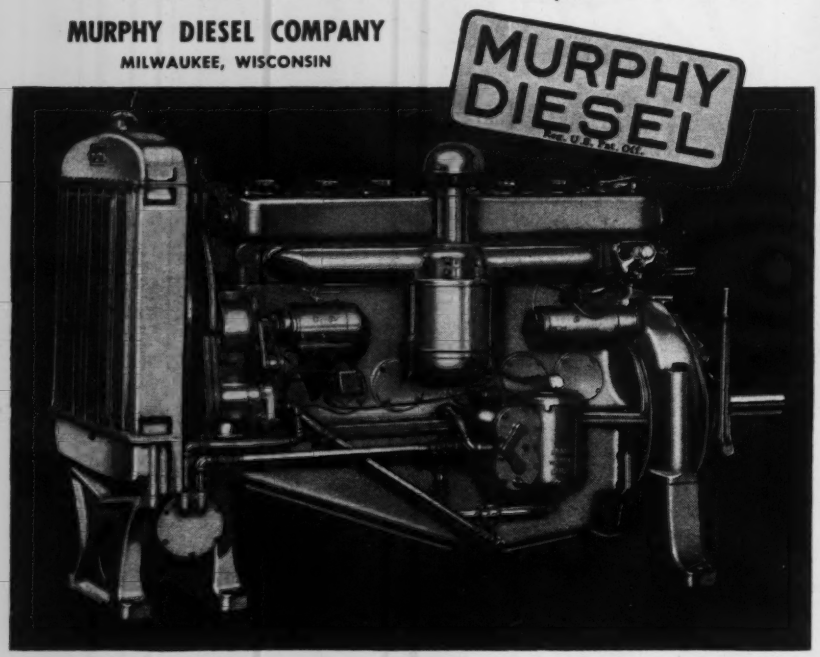
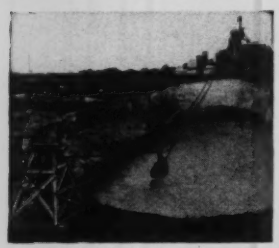


IN DRY GROUND . . . OR UNDER WATER

SAUERMAN Power Drag Scraper moving 35 loads per hour over a 400-foot operating span.



SAUERMAN Cableway moving dry and wet gravel to top of screening plant for a few cents per cubic yard.

dig, haul & dump

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SAUERMAN Long Range Equipment digs and delivers economically because:

- **Comparatively low cost installation.**
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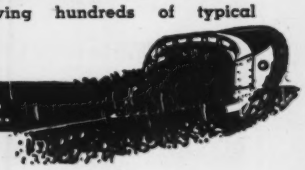
Our engineers are always freely at your service to give advice and suggest cost-reducing methods based on their 30 years' experience. Write for our catalog showing hundreds of typical Sauerman jobs.



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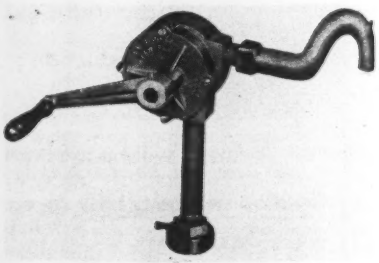
blade is of Escolite, 0.090 in. thick. Escolite is a special crystal-clear fully transparent plastic that will not discolor or turn brittle and will retain its transparency and accuracy indefinitely. Both the head and the blade are of special materials that will not warp, bulge, chip, crack or split. A swivel head attachment is available, if desired. A new catalog, available on request, describes the complete line of fine drawing room equipment available.—*The Engineering Sales Co., Sheboygan, Wis.*

Low Cost Pipe Couplings

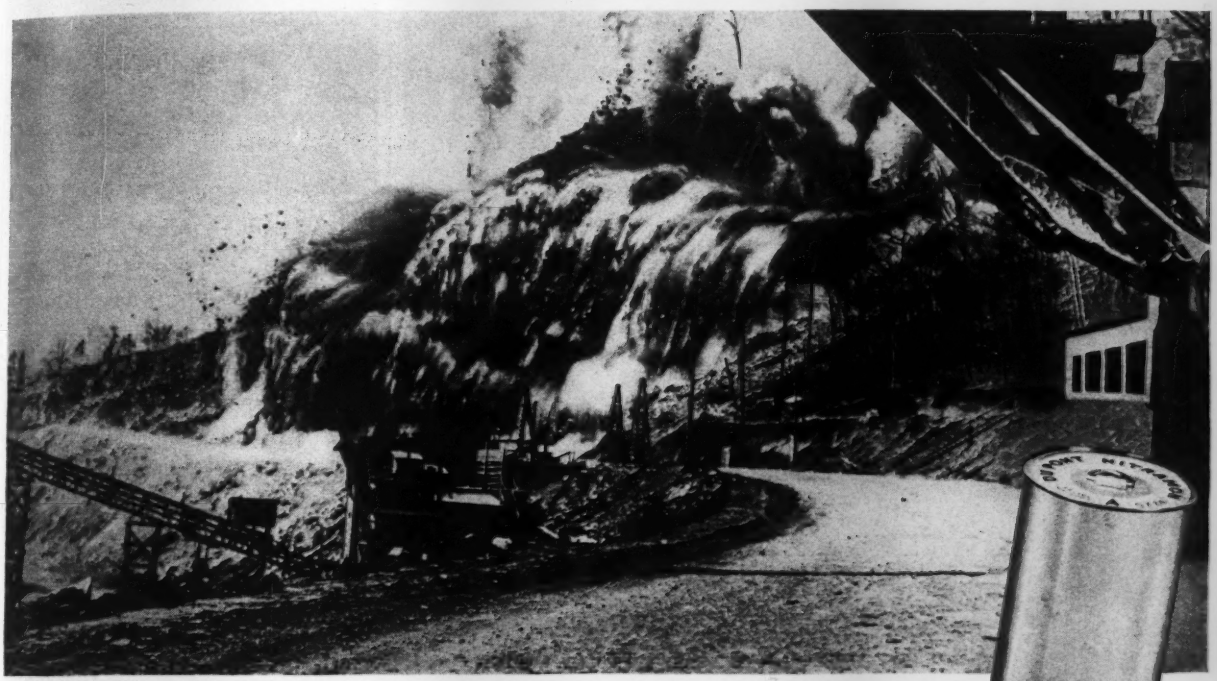
Couplings for plain end pipe are available for pipe sizes in the range from ¾ in. to 4 in. in a new design recently offered. The new couplings are of the type consisting of an internal sleeve surrounding the two pipe ends, against which at either end suitable gaskets are forced by means of a pair of interengaging body castings drawn together by bolts. Since covered sleeve arrangement offers greater resistance to corrosion and electrolysis, couplings can be used to advantage on underground pipe lines. Couplings can be furnished with special sleeves, gaskets and bolts to meet extraordinary conditions of service.—*Regor Products Co., 333 Kearny St., San Francisco, Calif.*



Barrel Pumps

The Even-Flo Thompson Pumps are said to be designed upon a new scientific suction principle and will do many jobs formerly impossible with a manually operated pump. They are claimed to have the following exclusive features: An even flow, whether at full volume or

Biggest blast in history of South brings down 506,000 tons of rock



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"There she goes"—506,000 tons of limestone for TVA's Cherokee Dam—brought down by 63 tons of NITRAMON, Du Pont's safer blasting agent. It's a record blast—for NITRAMON and for the South! But more than that, it's another indication of the acceptance NITRAMON enjoys today for blasting stone.

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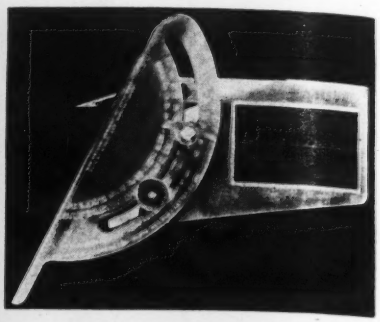
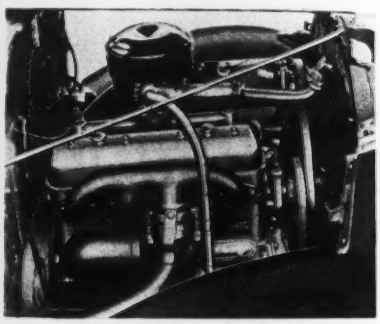
a mere trickle, positive self-priming under all conditions, no splashing non-drip and instantaneous stopping, reversible suction pumping in or out, and many others.—*W. D. Mills Engineering Co., 1410 De La Torre Way, Los Angeles.*



Framing Protractor

The Skilsaw roof framing protractor, now being introduced, is a portable unit. It is easily handled, easily carried, and eliminates hand-marking of rafters with steel square. This portable protractor is used where the cutting is done, four scales being provided, one pair for common and jack rafters, the other pair for hip and valley rafters. The protractor is calibrated in inches rise per foot of common rafter run, and also has a rafter length table for calibrating rafter length. —*Skilsaw, Inc., Chicago, Ill.*

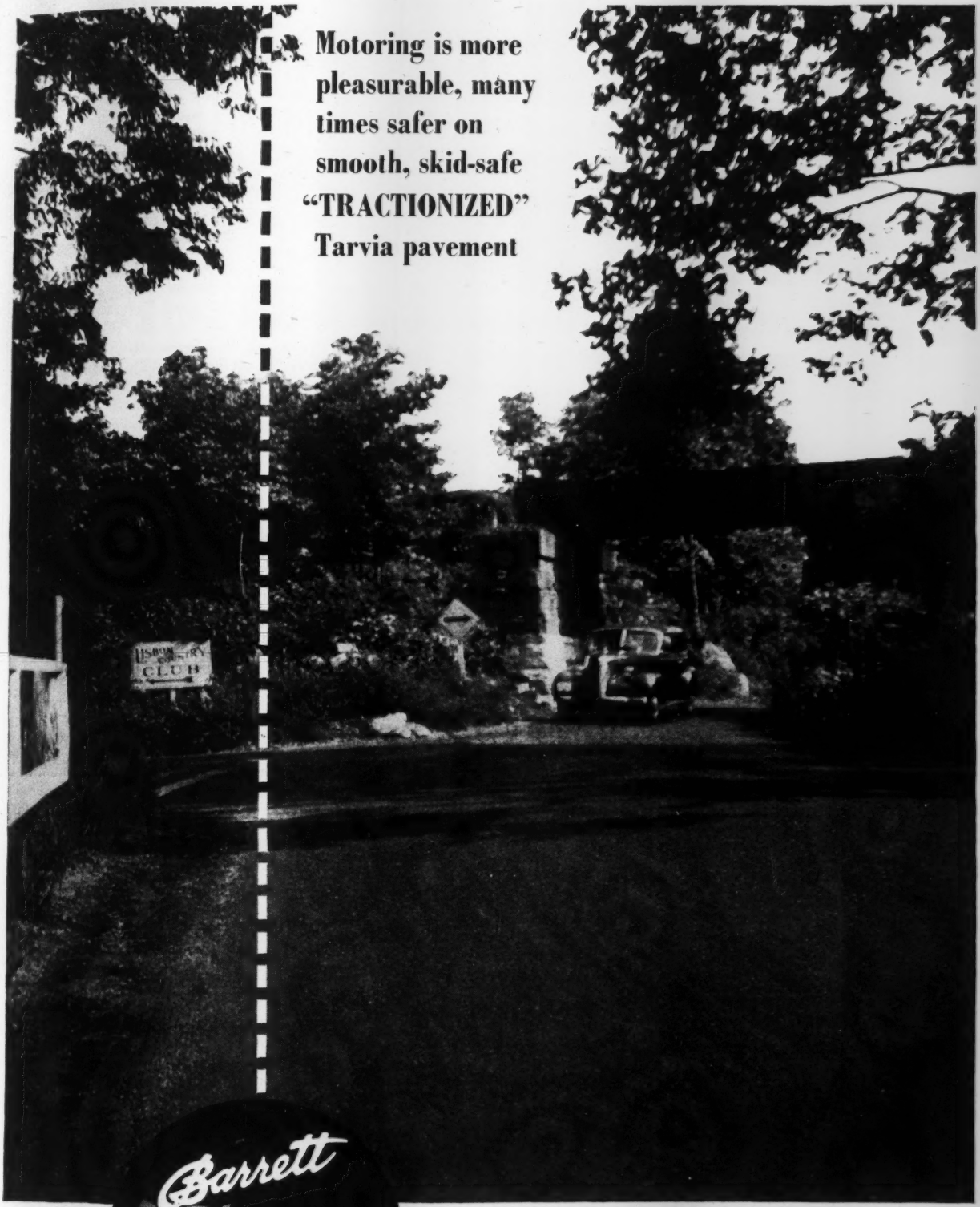


Diesels for Trucks

Hercules diesel engines, fully engineered for Chevrolet trucks, are available to replace the gasoline engines in both the conventional and cab-over-engine types of the 1½-ton chassis for 1940 and 1941. This is the same engine that is used by General Motors for export, though it is not presently on the domestic market in new trucks.—*The Hercules Motors Corp., Canton, Ohio.*

Mixer

A new 3½S non-tilting mixer has a 6 in. lower shoveling height, a self-cleaning hopper with no hopper gate to jam with aggregates or cement, has a sure shimmy hopper control which makes



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Barrett Tarvia
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(See Page 111, ENR July 3)

Lock Joint Pipe Co., Ampere, N. J.
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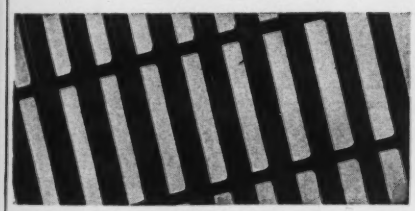
FILLET WELD



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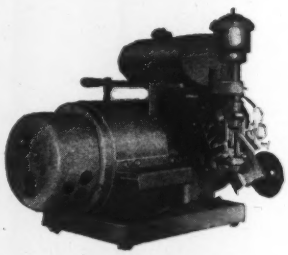
the stickiest material flow into the drum, and a chain belt drive. Known as the 3½S Skipper, it is an end discharge mixer mounted on two pneumatic tired wheels. It is equipped with a 3-1/3 hp. air cooled motor and can be furnished with or without water tank.—*Chain Belt Co., 1600 W. Bruce St., Milwaukee, Wis.*

Off-the-Road Tires

Goodyear has added four new off-the-road tires to its line: a new Earth Mover All-Weather tread; Low Pressure Sure Grip Grader, Hard Rock Lug, and the ML logger tire, each designed for a specific task. These new tires are better armored, are designed to give better traction and greater wear in their respective uses.—*The Goodyear Tire & Rubber Co., Akron, Ohio.*



Portable Generator

A new light weight portable unit has been added to the Kato line of generators, namely, the Model 23A which generates 500 watts 110 volt 60 cycle a.c. or 200 watts 6 volts d.c. current suitable for battery charging if desired. The outfit comes complete with Johnson 1 hp. "Iron Horse" single cylinder air-cooled four cycle engine and weighs 135 lb. net.—*Kato Engineering Co., Mankato, Minn.*

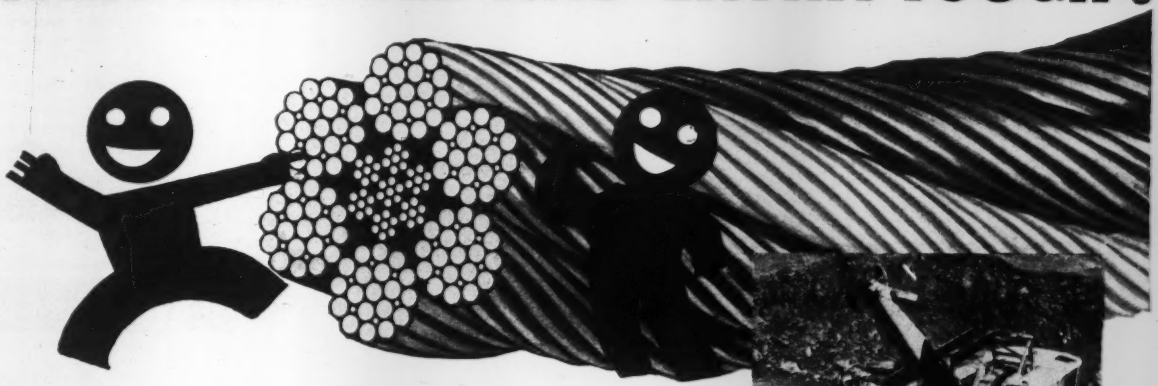
Emery Floors

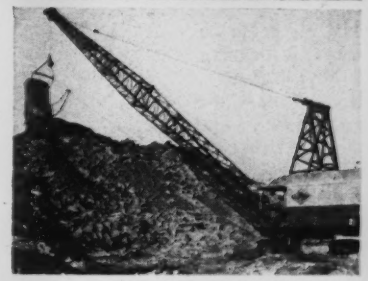
A topping of crushed emery, in a scientifically balanced proportion of large and small grains, mixed in the proportion of two parts of emery to one part of cement and spread on surfaces exposed to highly abrasive wear, has proven satisfactory for many installations. Laboratory tests indicate a compressive strength of over 14,000 lb. per sq.in. and a tensile strength of 1,100 lb. for the emery topping. As emery is practically non-absorbent, cracking of the floor surface is almost unknown.

The cost of the emery surfaces is said to be far below that of iron plates or grids, or of tile. The finished appearance is similar to that of terrazzo. Application of this material involves no special tools or skill.—*Walter Maguire Co. Inc., 330 W. 42nd St., New York City.*

2 KINDS

OF WIRE MAKE MONARCH PREFORMED EXTRA FLEXIBLE AND EXTRA TOUGH!





INNER WIRES ARE EXTREMELY FLEXIBLE. They're drawn in a special way to make them extra strong, extra pliable. They're improved plow steel too. They bend easily over your sheaves and drums. These wires are the reserve strength of Monarch Whyte Strand PREformed.

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The correct ropes for your equipment

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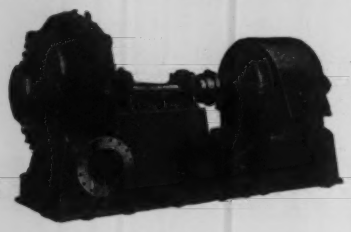
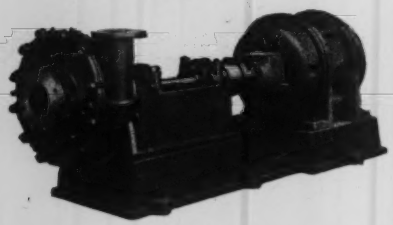
The MORRIS HYDRAULIC COLUMN

News of interest to Centrifugal Pump Users



WITH TWELVE different designs of abrasive handling pumps in the Morris Centrifugal Pump line, you are sure of an exactly suitable selection for your sand and gravel-handling requirements.



THESE MORRIS DESIGNS range from a simple, low-cost sand pump with only three wearing parts, to high-head alloy-steel lined dredging pumps which have proven their wear-resisting and long-lasting qualities on the severest service.

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MEMBER

For authoritative recommendations on any pumping or dredging problem, write to Morris Machine Works, Baldwinsville, N. Y. Representatives in principal localities. *Export Office*, 50 Church St., New York.

NEW PUBLICATIONS

Shovels—The P&H Model 855 shovel, with its new hydraulic control system, is described in a new bulletin. The simple, low pressure hydraulic control system used on the P&H 855 is based on the same principle used in the automotive industry for the past 15 years and is so responsive that the operator is able to "feel" the load at all times. This machine can be quickly and simply converted from shovel to dragline, crane or clamshell. Further details in Bulletin X-20-1.—*The Harnischfeger Corp., Milwaukee, Wis.*

Conveyor Belt—A catalog section on a new turnable conveyor belt describes the belt's functions, reasons for its patented design, and gives details on the construction and proper methods of turning the belt.—*The B. F. Goodrich Co., Arkon, Ohio.*

Tructractors—An 8-page bulletin describes Clark tructractors in 30- and 40-cu.ft. models and with platforms. Also detailed is the Clark power shovel, a digging unit with power hoist mounted on a three-wheel tractor.—*Clark Tructractor, Battle Creek, Mich.*

Electric Motors—A well illustrated, concise and graphic booklet literally takes the new G.E. Tri-Clad Motor apart to show how extra protection has been built into the line. Particular attention is called to the motor's one-piece, cast-iron frame and end shield for protection against physical damage; the stator windings of tough Formex wire; and the new design of bearings for protection against operating wear and tear. Ask for Publication GEA-3580.—*General Electric Co., Schenectady, N. Y.*

Diamond Drill Fittings—A Commercial Standard for Diamond Core Drill Fittings, CS17-42, is now a recorded standard of this industry, effective for new production from Jan. 1, 1942. The purpose of this commercial standard is to provide dimensional interchangeability in essential diamond core drill fittings as made by American manufacturers.—*National Bureau of Standards, U. S. Department of Commerce, Washington, D. C.*

Hangars—Timber can be used to meet promptly and effectively, the need for hangars on the 3,500 civilian airports this country must immediately construct. An 8-page, letter-size pamphlet on "Wood Hangars of Douglas Fir" is available, illustrating the use of timber in hangar construction and describing

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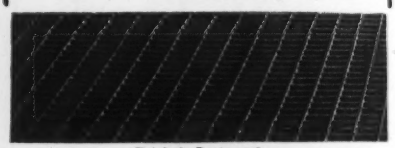
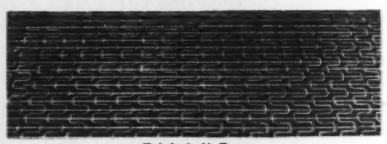
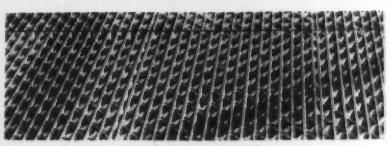


Tri-Lok Rectangular



Tri-Lok U-Type



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The Development of Amsco Renewable Lip Dippers

Design Changes Met Changing Needs of Power Shovel Builders and Users

Back in 1911, the Amsco *Missabe* Manganese Steel Dipper was introduced. It was of 2-piece body design—a front casting with integral lip riveted to a back casting with overlapping sections at rivet joints.

At times, a riveted-on renewable lip was applied to the design so that a front need not be scrapped when the lip, which bears more of the wear, had become worn.

Changing riveted lips was a time-consuming, work-hampering job usually necessitating trucking the dipper to a repair shop; and it remained for Amsco to introduce the first truly Renewable Lip Dipper in 1930 with the patented "U"-bolt fastening, interlocking-joint design. It enabled lips to be changed in a matter of minutes instead of hours—4 nuts and 4 keys had only to be removed and "off she came."

Then in 1938, as the demands for higher digging and loading speeds and greater capacity were made, an improved dipper of two-piece body design with the rivetless renewable lip was introduced. This provided for replacing not only the lip, but a riveted-on front when it had become worn.

Since 1930 the lip design has evolved from the original blunt box shape to the present extended, rounded contour, sharp-edged lip with "fanned" teeth. Too, lips are carried further up the sides of the back casting, shortening the "U"-bolt, substantially increasing the rigidity of the entire unit, enabling teeth and lips to withstand the heavier stresses imposed upon them. Reduced overall weight, smoother interior and a double taper outwardly from top to door insure faster and maximum loading and faster, cleaner dumping.

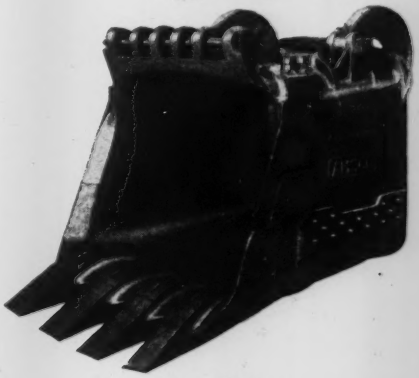
Over 3,500 Amsco Renewable Lip Dippers have been placed in service since the introduction of the Renewable Rivetless Lip in 1930. They have helped the upbuilding of America, and provided greater profit for users by substantially lowering their digging and handling costs.

Amsco Renewable Lip Dippers (U. S. Pat. 1945064) are made in all sizes from ¾ yd. capacity up with bail and back lugs arranged for any type of dipper stick. Buckets smaller than ¾ yd. are usually a one piece type without renewable lip.

Send for new Bulletin 641-D explaining the advantages of genuine 13% Manganese Steel and picturing all types and sizes of standard and special Amsco Dippers, Dipper Parts and Teeth.

in 1930
dipper No. 1

in 1938
dipper No. 2500



in 1941
dipper No. 3500

Amsco

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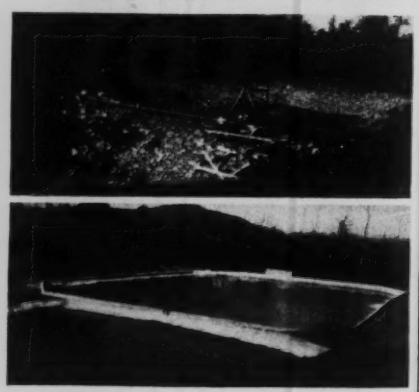

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Our Bulletin 1200 contains descriptions and illustrations of many types of water works construction in "GUNITE", as well as numerous other uses. Send for a copy today!

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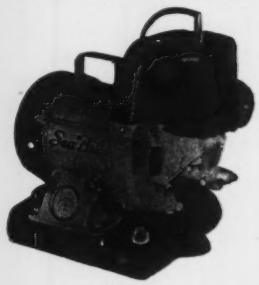

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the results of fire tests on timber hangars. Timber truss designs are shown and data are given about Civil Aeronautic Authority plans for hangars. *West Coast Lumbermen's Association, Seattle, Wash.*

Jacks—A folder describes the many jacks available under the Simplex trademark: ball-bearing screw jacks, journal jacks, track jacks, geared jacks, push-and-pull jacks, steamboat ratchets, etc.—*Templeton, Kenly & Co., 1020 S. Central Ave., Chicago, Ill.*

Lubrication—A 64-page, 5x7½ in. size, lubrication handbook has just been issued by Valvoline which is now celebrating its diamond jubilee. Complete information is included on all makes of trucks, tractors, passenger cars, fire apparatus, motor buses, motorcycles, as well as marine, aviation and industrial engines.—*Valvoline Oil Co., Cincinnati, Ohio.*

Chain Link Fence—A new and greatly improved Page Fence catalog is divided into sections so that the fence buyer can quickly select the Page Fence for his particular needs. Each section is devoted to a particular type of fence and is complete with large pictures, description and specifications. Technical construction details are illustrated by simple line drawings so that unimportant, confusing non-essentials are eliminated.—*Page Steel & Wire Div., American Chain & Cable Co. Inc., Monessen, Pa.*

A-C Adjustable Speed Drive—A-c adjustable speed drive between 1 and 15 hp. for use over a wide speed range, is described in a new 4-page bulletin. Simplicity, reliability and overload protection features are discussed and design details of motor generators, d-c drive motors, and rheostats are given. Ask for Bulletin DG-4063.—*Department 7-N-20, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.*

Loaders—White loaders for wheel tractors are described in a 4-page circular. These loaders are available for four popular models of wheel type industrial tractors—Case DI, International 1-6 and 1-30 and Minneapolis-Moline UT-1 to which they can be readily applied or detached. Bucket capacity is ⅜ cu. yd. with a standard 42-in. wide bucket.—*White Mfg. Co., Elkhart, Ind.*

Compressors— A colorful and interesting booklet describes the Mobil-Air line of compressors. This line features a convertible engine using either gasoline or oil, two stage air cooled compressor units, and most important, a multi-speed regulator which adjusts the

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ILLUSTRATED: BELOW, *Hydraulic Torque Converter and* RIGHT, *Hydraulic Power Take-off.*

engine speed to the use of the air, practically eliminating wasteful idling. Ask for Form 3075.—*Ingersoll-Rand, 11 Broadway, New York City.*

Gar Wood Truck Bodies—Four new catalogs have been released describing the Gar Wood line of truck bodies. Bulletin 7 illustrates and completely describes the hoist and dump bodies for 1½ to 2 ton trucks. Bulletin 16 describes special equipment applicable to Ford trucks. Bulletin 17 gives special details on bodies for Chevrolet trucks.

Bulletin 27 describes the Gar Wood Load-Packer claimed to be the newest, fastest, most sanitary and economical way to collect and haul garbage and rubbish.—*Gar Wood Industries, Inc., Hoist and Body Division, Detroit, Mich.*

Drybrow—A new folder describes the Drybrow, an absorbent pad for wearing on the forehead to prevent perspiration running into the eyes and over glasses.—*American Allsafe Co. Inc., 1245 Niagara St., Buffalo, N. Y.*

Thermit Welding—A new 36 page booklet describes the Thermit welding process and its applications. Profusely illustrated, the new booklet explains Thermit reactions and gives considerable information on the physical properties of Thermit welds. The booklet covers the possibility of using Thermit welding for the fabrication of very heavy machine parts.—*Metal & Thermit Corp., 120 Broadway, New York City.*

Diesel Power—"What Users Say About Caterpillar Diesel Power" is the title of an attractive 16 page booklet dealing with statements users make regarding "Caterpillar" diesel power. Problems solved by application of diesel power are discussed, and installations portrayed. Ask for Form 6636.—*Caterpillar Tractor Co., Peoria, Ill.*

Transmission Belts—Catalog Section 2150 just published by Goodrich under the title "Selection and Maintenance of Rubber Transmission Belts" advises the type, grade, width, thickness, etc., for proper use of rubber transmission belts. This publication points out in what respect belt transmission theory, developed through past generations as applying to leather belting, has been modified as applied to modern constructions of non-stretching rubber belts.—*The B. F. Goodrich Co., Akron, Ohio.*

Ventilation—Specifications for the complete line of Ilg products are given in a new illustrated catalog No. 141. This includes diagrams and installation views of propeller fans, automatic shutters, fan guards, motor, etc. The catalog contains diagrammatic demonstrations of

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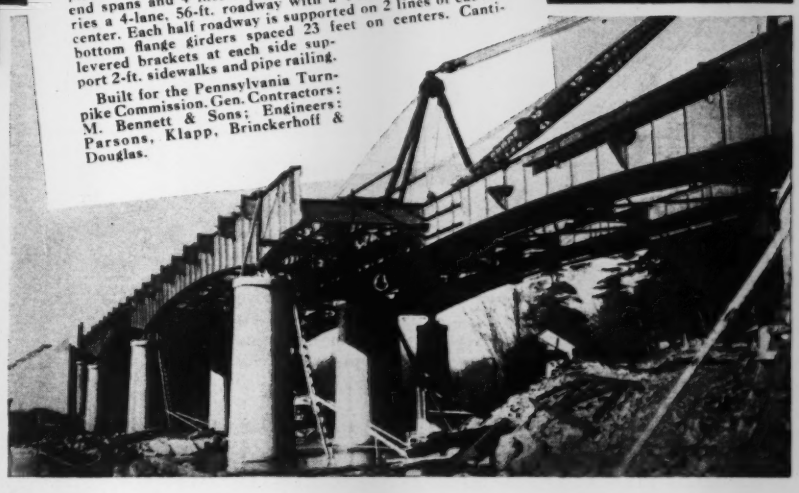
DUNNINGS CREEK BRIDGE— a continuous-type, skew, plate girder structure, 480 feet long, comprised of 48-ft. end spans and 4 intermediate spans, each of 96 ft. It carries a 4-lane, 56-ft. roadway with a 4-ft. division strip in center. Each half roadway is supported on 2 lines of curved bottom flange girders spaced 23 feet on centers. Cantilevered brackets at each side support 2-ft. sidewalks and pipe railing.

Built for the Pennsylvania Turnpike Commission. Gen. Contractors: M. Bennett & Sons; Engineers: Parsons, Klapp, Brinckerhoff & Douglas.



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Of the five bridges that are American Bridge-built, the plate girder structure over Dunnings Creek, in Bedford Township, is of special interest. Esthetically pleasing in its simplicity of treatment and efficient use of durable steel, the Dunnings Creek Bridge was singled out by the Jury of Award of the American Institute of Steel Construction as the most beautiful "Class B" (cost range between 250,000 and 1,000,000 dollars) steel bridge opened to traffic during 1940.

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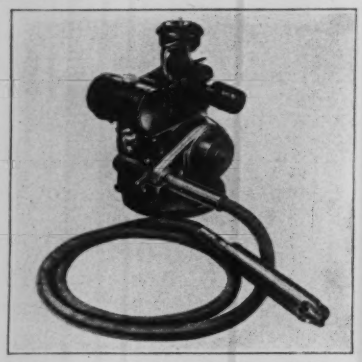
UNITED STATES STEEL



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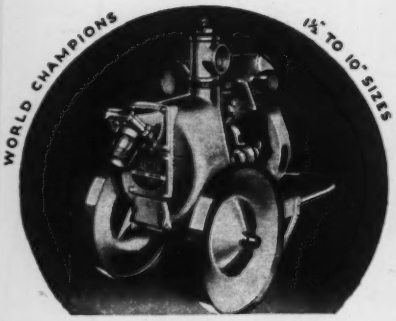

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how Ilg blowers save space, reduce friction and cut costs.—*Ilg Electric Ventilating Co., 2850 N. Crawford Ave., Chicago, Ill.*

Compressors — A folder describes Pennsylvania compressors and vacuum pumps of the horizontal, double acting, water cooled type designed for continuous heavy duty.—*Pennsylvania Pump & Compressor Co., Easton, Pa.*

Ball Bearings—Improved methods for handling, mounting and lubricating ball bearings are described in a new shop manual prepared by New Departure for distribution to all personnel interested in maintenance of bearings.

New Departure also has available the 15th edition of their Handbook listing the principal types and sizes of the forged steel ball bearings.—*New Departure Division of General Motors Corp., Bristol, Conn.*

Transmission Equipment—A 20 page booklet describes labor saving methods in transmission of materials by various conveyor installations in several parts of the country. Friant Dam aggregate and mixing plants are featured and other interesting information is given. — *Stephens-Adamson Mfg. Co., Aurora, Ill.*

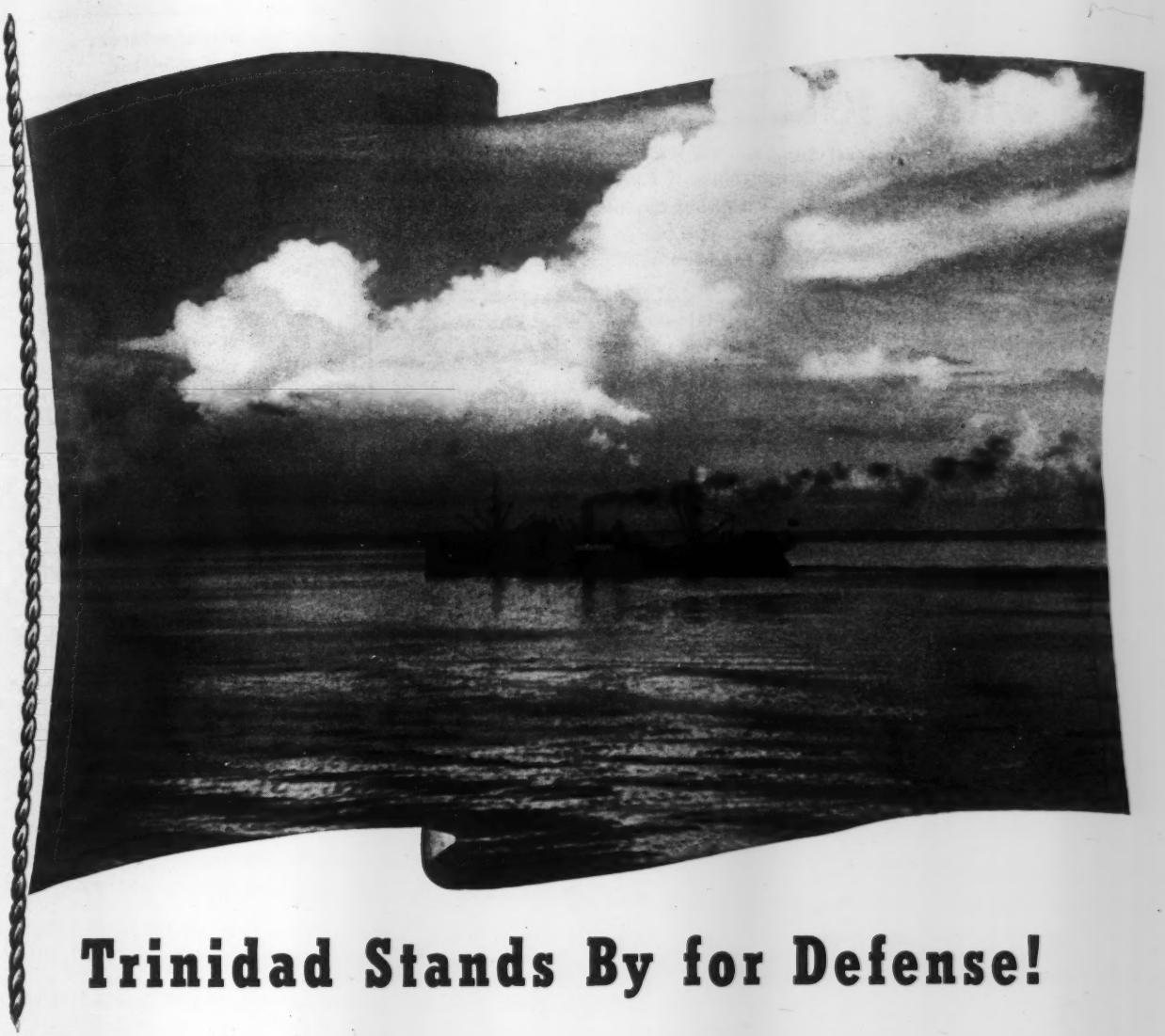
Concrete Vibrators—A mailing piece describes the types of Mall concrete vibrators available and pictures their use on several construction jobs.—*Mall Tool Co., 7740 S. Chicago Ave., Chicago, Ill.*

Concrete Mixer—An 8 page, two color bulletin, No. 177, describes 14-S Ransome concrete mixers.—*Ransome Concrete Machinery Co., Dunellen, N. J.*

Jacks—Catalog 200, a newly revised data book on industrial jacks, contains 64 pages of useful reference material, listing equipment for every type of lifting, lowering, pushing and pulling.—The *Duff-Norton Mfg. Co., Pittsburgh.*

Earth Moving—Advertising leaflets are available describing Adams No. 100 hauling scraper and No. 304 motor grader, a 50 hp. gasoline powered outfit with a wide range of blade adjustments. The No. 100 scraper is a double-cable controlled, 12½ yd. rig for use with 70-100 hp. tractors.—*J. D. Adams Co., Indianapolis, Ind.*

Fluorescent Lighting—A 20 page pocket catalog, No. 240, pictures the entire line of Mitchell commercial and industrial fluorescent lighting fixtures with brief engineering and sales data on each unit.—*Mitchell Mfg. Co., 2525 Clybourn Ave., Chicago.*



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Naturally, this means that transportation of Trinidad Native Lake Asphalt must be curtailed. And we know that the vast majority of our American customers will support Barber's policy of making way for materials and supplies that are urgently needed in this hour of emergency.

Occasionally, space is available. In such cases we load as much Trinidad Lake Asphalt as space and time permit . . . without delaying the sailing! But these instances are rare.

To those who depend on the unique advantages of Trinidad Native Lake Asphalt, Barber pledges every effort to make any possible deliveries. As soon as conditions permit, Barber will immediately resume full-scale importation of this vital asphalt.

Meanwhile, Barber manufactures a complete line of the highest quality petroleum asphalt products for highway construction and maintenance.

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Contractors and Engineers! Save on electrical construction jobs. Bury wire, cable, and conduit with a Killefer Wire Layer or Cable Layer. Plant one or two reels of insulated wire without ditching for telephone lines and for airport field lighting systems. At a speed of 9 to 14 minutes per 3,000 feet bury cable or conduit for high tension and radio ground lines. NO DITCHING! NO BACKFILLING! Write for booklet "How To Bury Wire Without Ditching".

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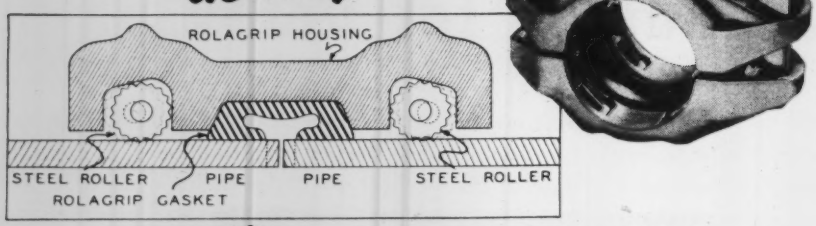
"They Hold as They Yield"



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Pipe Couplings for Plain End Pipe

The ribbed rollers do the trick—"They hold as they yield." A perfect seal is assured with Rolagrips and plain end pipe . . . no grooves or threads necessary. Rolagrips, in addition to giving play to normal forces of expansion and contraction, permit maximum angular deflection. To save time, labor and expense—depend on Rolagrips. Write for details.

G·B MFG. CO

GUSTIN-BACON MFG. CO.
KANSAS CITY, MO.
NEW YORK CHICAGO SAN FRANCISCO
TULSA FT. WORTH HOUSTON

Manufacturers' Activities

W. McKean White, Jr., has been elected vice president of the White Mfg. Co., Elkhart, Ind., manufacturer of asphalt plants and equipment, vibrators, tractor front end loaders, etc.

American Creosoting Co. sales and advertising headquarters have been moved from Chicago to 401 West Main St., Louisville, Ky.

Gar Wood Industries, Inc., Detroit, has appointed the Standard Truck Equipment Co., Jackson, Miss., as authorized distributor for the hoist and body division.

The Smith Engineering Works, of Milwaukee, manufacturers of "Telsmith" crushers and equipment for quarries, mines and gravel plants, has announced the appointment of Harry Bückenheu as New York district manager, with northern New Jersey, all of New York State and southern Connecticut as his territory.

Harry McCool, Jr., has been appointed southwestern sales representative for the steel and tube division of the Timken Roller Bearing Co., Canton, Ohio. Mr. McCool's territory includes Kansas, Louisiana, Oklahoma, Arkansas and Texas, with headquarters at Dallas.

Allison Miller has been appointed assistant sales manager, truck division, Dodge Brothers Corp. Previous to his present appointment, Mr. Miller was Philadelphia regional manager for Dodge.

Industrial Products Co., manfacturers of safety equipment, have moved to larger quarters at 2820 N. Fourth St., Philadelphia.

Dardelet Threadlock Corp. has removed its operating office from New York City to Detroit, locating in the Machinery Building, 2832 East Grand Blvd., and Edwin H. Jackson, a pioneer in the motor car industry, has assumed the duties of president.

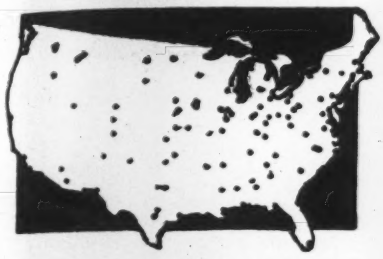
Certain-teed Products Corp. has announced the appointment of Gordon C. Estes as assistant to C. E. Stedman, vice president in charge of sales, with headquarters at 100 East 42 St., New York.

Link-Belt Speeder Corp. has announced the appointment of Cunningham-Goggin Co., 610 W. Michigan St., Milwaukee, as authorized distributor for the complete line of Link-Belt Speeder shovels-draglines-cranes, ranging from fast, mobile 3/8-yd. units to heavy-duty 3-yd. machines.

CONSTRUCTION REPORTS

Compiled by Business News Department—Engineering News-Record, 330 W. 42nd St., New York
ELSIE EAVES, Manager *SCOTT McLEOD, Statistician*
(Daily service also available—Write for details)

Location of ENR Correspondents



Symbols and Abbreviations Include:

† Federal Government
★ Project of $500,000 or over
ENR Engineering News-Record
CD Engineering News-Record Construction Daily

Projects—By Size

Construction projects here reported cover the United States and Canada, are of these minimum sizes or larger; water supply, earthwork, waterworks, $15,000; other public works, $25,000; industrial buildings, $40,000; other buildings, $150,000.

Classes of Construction

(Named in order of Listing)

Water Supply — Unclassified
Sewers, Waste Disposal — Latin America
Bridges, Grade Cross'gs — Public Buildings
Streets & Roads — Commercial Buildings
Earthwork, Waterways — Industrial Buildings

Stages Reported

PROPOSED: (except Streets & Roads):

BIDS ASKED (new announcements only. For full calendar, see also preceding issues of ENR);

LOW BIDDERS: All low bidder news will be the final reports published on the projects involved except where award is not made to the low bidder. In this case, a supplementary contract award report will be published.

CONTRACTS AWARDED: Except awards to low bidders previously reported in low bidder stage.

Dates shown are of issue in which last previous report was published.

WATER SUPPLY

PROPOSED WORK

Ark., Little Rock—C. E. Mayer, mayor, enlarging municipal WW sys. $135,000.

Ill., Vandalia—Lake for city water reservoir. $25,000.

Ind., Scottsburg—E. Hamilton, town clk., WW imprvs. and addns. $60,000 or more with equip.

Ia., Agency—Bond election July 23, WW sys. $18,000. CD 7/1—ENR 7/10.

Ia., Corning—700 ft. dam, 30 ft. high, to create 70 acre lake on East Nodaway River as reservoir for water sys. $40,000.

Ia., Corning—Water supply sys., dam, artificial lake, spillway and piping. $35,000. Henningson Eng. Co., Standard Oil Bldg., Omaha, Neb., engr. CD 7/2—ENR 7/10.

Ia., Sioux City—C. A. Norrbom, city clk., bids soon imprv., repairing reservoir in Grandview Park. $82,169. K. C. Gaynor, city engr.

Kan., Gorham—Ruben Morgenstein, mayor, WW sys. watermains, 2 deep wells, pumps, pumphouse, steel tank on tower, fire hydrants, valves, boxes. $50,000. Paulette & Wilson, 215 W. Ash St., Salina, engrs.

★**Kan., Mission Twp.**—Mission Twp., c/o Mr. Pfumm, 5822 Reeds Rd., Johnson Co., water supply to Mission and Shawnee Twps. $1,000,000. Shockley Eng. Co., Graphic Arts Bldg., Kansas City, Mo., engr.

Mo., Kansas City—Waterline exten. to Grand View Airport and storage tank at airport. $387,000. A. C. Everham, dir. P. Wks.

Neb., Wilber—V. J. Kohout, mayor, completed preliminary plans WW imprvs., mains and elevated water tank. $95,000. Paulette & Wilson, Salina, Kan., engrs.

N. J., Newark—Water Dpt., City Hall Annex, watermains. $30,900. WPA. W. Banks, City Hall Annex, Newark, WPA and owner's engr.

N. J., Wanaque—North Jersey District Water Supply Comm., Wanaque, imprv. Wanaque reservoir, landscaping, paths, grading, etc. $40,500. WPA. J. F. Sheehan, foot of 5 Ave., Paterson, WPA and owner's engr.

N. C. Concord—Bond election August 5, WW sys. and streets. $398,000. E. E. Deal, mayor.

Pa., Beaver Falls—Bd. Comrs., Boro Twp., waterworks and distr. sys. $300,000.

Pa., Beaver Falls—Beaver Falls Municipal Auth., c.i. watermain. $15,000.

Pa., Montoursville — Boro Council, 300,000 gal. concrete reservoir, 8 in. connecting line, etc. $25,500. Gannett, Eastman & Fleming, Inc., 600 N. 2 St., Harrisburg, engrs.

Wis., Theresa—A. W. Boegel, town clk., WW and sewerage sys. W. G. Kirchoffer, 22 N. Carroll St., Madison, engr.

BIDS ASKED

Bids Asked July 29

Mo., Kansas City—Settling basin addns. and alterations in connection with water softening plant, North Kansas City. $350,000. Bids July 1, rejected. Black & Veatch, 4706 Bway., Kansas City, Mo., engrs. CD 7/8—ENR 7/10 under LB.

Bids Asked August 2

La., Bogalusa—City Comn. furnishing, erecting 2 elevated steel water storage tanks. L. J. Voorhies, 3000-A Dalrymple Dr., Baton Rouge, engr. CD 2/17—ENR 2/20.

Bids Asked August 14

N. C. Concord—Mayor and Bd. Light & Water Comrs., 6 m.g. filter plant, 2 m.g. concrete reservoir, 100,000 gal. elevated tank, pipelines, etc.; adv. ENR 7/17.

Bids Asked

★**†Fla., Key West**—Navy Dpt., 18 St. and Constitution Ave. N. W., Wash., D. C. July 9, (installation only) fresh water pipe line from Florida mainland to Key West, from Williams Bros. Corp., Natl. Bank Tulsa Bldg., Tulsa, Okla. Est **$1,000,000.** CD 7/3—ENR 6/5.

Vt., Brattleboro—Town, Bd. Selectmen, Town Hall, 2.7 mi. 10 in. c.i. water pipeline, 400 ft. bridge crossing. $52,000. CD 4/18—ENR 4/24.

LOW BIDDERS

★**Conn., Waterbury**—Street, Sewer & Water Dpt., 114 Benedict St., July 8, 13 mi. 12- to 42-in. pipelines, part of water sys. exten., from Lock Joint Pipe Co., Newington Ave., Newington, and Ampere, N. J. **$895,000.** CD 6/17—ENR 6/19.

Ill., Salem—City, June 12, enlarging WW filtration plant, piping, accessories, sewage disposal plant addn., from Krall Constr. & Eng. Co., Salem, about **$111,000.** CD 5/29—ENR 6/5.

Kan., Topeka—L. B. Smith Water Comn., elevated steel water tank, from Chicago Bridge & Iron Wks., 332 S. Michigan Ave., Chicago, Ill., **$92,800.** CD 6/24—ENR 6/26.

Mass., Methuen—T. Mahoney, supt. Water Dpt., July 7, pump. station from Louis C. Cyr, 45 Melrose St., Lawrence, **$9,635**; equip., from Ralph P. Hall, Inc., 141 Milk St., Boston, **$17,896.** Bids 7/7——CD 7/2.

CONTRACTS AWARDED

†Colo., Denver—Con. Q.M. Denver, 16 in. water supply main, Fitzimmons General Hospital, to Schwartz Constr. Co., 25 E. Bijou St., Colorado Springs. **$72,835.** Bids 6/6.

†Colo., Denver—U. S. Eng., 1709 Jackson St., Omaha, Neb., 500,000 gal. water storage tank and tower, Lowry Field, to Pittsburgh Des Moines Steel Co., 1015 Tuttle St., Des Moines, Ia. **$53,775** for 100 ft. tower, **$52,140** for 90 ft. tower. Est. $63,000. Bids 6/28. CD 6/26.

†Ill., Fort Sheridan—Con. Q.M., Fort Sheridan, elevated steel water tank, to Chicago Bridge & Iron Co., 332 S. Michigan Ave., Chicago. **$38,750.** Bids 6/17. CD 6/9—ENR 6/12.

Ia., LeClaire—F. Meyer, mayor, municipal water sys. **WPA. $65,269.** CD 5/13—ENR 5/15.

Ia., Lorimore—WW sys. **WPA. $30,000.** CD 6/12—ENR 6/19.

†Ky., Fort Knox—Con. Q.M., water treatment plant, to W. L. Hailey & Co., 106 Cotton States Bldg., Nashville, Tenn. **$294,250.** Bids 6/27. CD 6/25.

Mont., Glendive—A. Colin, clk., imprv., exten. water supply sys. **WPA. $30,000.**

N. J., Bound Brook—Bakelite Corp., 247 Park Ave., New York, brick, rein.-con. pumphouse, 1 story, 30x70 ft., rein.-con. cooling tower, 12 concrete, steel tank fdns., cooling pump, water sys., etc., to W. L. Blanchard Co., 45 Pionier St., Newark. **$36,000.**

†N. J., Clark—Federal Works Agency, 7 and D Sts. S.W., Wash., D. C., 3- to 8-in. c.i. water mains, various streets, defense housing. **WPA. $37,772.** J. H. Weltzen, Smith and Hobart Sts., Perth Amboy, owner's and WPA engr.

N. J., Newark—Street Dpt., City Hall Annex, watermains, Doremus Ave. **WPA. $44,900.** CD 6/2—ENR 6/5.

Pa., Erie—Bureau Water, 701 French St., WW exten., Peach St. exten., Washington Ave., Gore Rd., etc. Own forces. **$20,000.** CD 7/8—ENR 7/10.

Pa., Scranton—Scranton Spring Brook Water Serv. Co., 127 Jefferson Ave., exten. c.i. watermains into upper East Mountain area, near here. Own forces. Over **$30,000.** CD 6/30—ENR 7/3.

Tex., West Columbia—Imprv. water sys., new mains, meters, valves, reconditioning well, brick pump house. **WPA. $100,278.** J. L. Williams, Edna, engr.

†Tex., Wichita Falls—U. S. Eng., Denison, c.i. water supply lines to Aviation Mechanics School, Project 1, to Johns-Manville Sales Corp., 2107 Griffin St., Dallas, **$57,757**; Project 2, to American Cast Iron Pipe Co., 2424 Myrtle Ave., Dallas, **$53,178.** Bids 6/14. CD 6/9.

Alta., Suffield—Dpt. National Defense, Ottawa, Ont., supply, installation water storage tank, at Field Experimental Station, to Horton Steel Wks. Ltd., Northern Ontario Bldg., Toronto, Ont. **$25,000.**

N. B., Scoudouc (Moncton)—Dpt. National Defense, Ottawa, Ont., water and sewer services, #3 Repair Depot, to Diamond Constr. Co., Ltd., Royal Bank Bldg., Fredericton. **$40,000.**

Que., Senneville—Village, 10,000 lin. ft. watermains, to C. Perluzzi Constr. Co., Ltd., 9300 Lajeunesse St., Montreal. **$35,000.** W. S. Lea, 1226 University St., Montreal, engr.

SEWERS, WASTE DISPOSAL

PROPOSED WORK

†Ariz., Higley—U. S. Eng., Wash., D. C., sewage disposal and treatment plant at new U. S. Army Air Corp. Basic Flying Field, near here. $70,000. Scott Eng. Co., Ellis Bldg., Phoenix, engrs.

Ark., Little Rock—C. E. Mayer, mayor, sewer facilities. $150,000.

Calif., Los Angeles—15,345 ft. 8 in. vitr. clay sanitary sewers in Carmelina Ave. and Shady Dr. Sewer Dist. $40,000. L. Aldrich, City Hall, engr.

★**Kan., Wichita**—City and Sedgwick Co., exten. sewer lines, sewage disposal plant addn., watermain exten. $1,800,000.

★**Ky., Louisville**—Comn. Sewerage, M. E. Taylor Bldg., preliminary plans sewage disposal plant and sys. addn. $6,000,000.

†N. J., Clark—Federal Works Agency, 7 and D Sts. S.W., Wash., D. C., 4- to 8-in. sanitary sewers. $53,250. J. H. Weltzen, Smith and Hobart Sts., Perth Amboy, N. J., owner's and WPA engr.

N. J., Hammonton—Atlantic Co., Courthouse, Atlantic City, drainage sys. various streets. $70,165. WPA. G. R. Swinton, 930 Atlantic Ave., Atlantic City, WPA and owner's engr.

N. J., Newark—Sanitary sewers, $65,500. WPA. J. Costello, City Hall, Newark, WPA and owner's engr.

N. J., Wood Ridge—Boro, alterations, addns. sewage treatment plant, sanitary sewers. $100,000. R. Brown, 12 Park Ave., Rutherford, engr.

Pa., Jersey Shore—Incinerating plant. $50,000 plus.

Pa., Mt. Holly—Boro Council M. Reynolds, in charge, sewage disposal plant. 75,000.

S. D., Sioux Falls—B. T. Yeager, city comr., additional imprvs. sewage disposal plant. $45,000.

Tex., Brackettville—C. B. Ballantyne, mayor, voted bonds, sanitary sewerage sys. $45,000.

Tex., Dalworth—W. B. Young, mayor, voted bonds, disposal plant $40,000; exten. sanitary sewer sys., collecting lines, $40,000. CD 6/19—ENR 6/26.

2 THINGS TO KNOW ABOUT DETACHABLE BITS

1 WHAT THEIR ADVANTAGES ARE

More and more people are switching to detachable bits. The chances are you, too, will want to make the change when you examine this list of advantages:

1 *They reduce steel-shop costs.*
2 *Nipping charges are reduced.*
3 *They eliminate the necessity of carrying steel in and out of working places, which permits more time for drilling.*
4 *Bits drill faster than ordinary steel drills.*
5 *Bits are safe in use in stopes and raises.*
6 *Rod lengths and bits can be standardized.*
7 *Bits work well in muddy or soft ground.*

2 HOW TO KEEP THEM IN CONDITION

The secret of realizing all the advantages of detachable bits is in keeping them properly ground. For best results... for lowest cost per grind and the most work from each resharpened bit... you've got to use the *right* grinding wheels for forming and gauging.

One way to be sure of getting the right wheel is to specify Aloxite Brand Aluminum Oxide Wheels. These long-lived wheels are especially made by Carborundum to hold their shape, and to cut fast, free and cool. They assure you accurate gauge and form... longer tool life between grinds... reduced grinding time... and lower cost per grind.

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SEWERS, etc. (Proposed Work, Cont'd.)

Tex., Galveston—B. Harris, mayor, incinerator $136,000, imprv., expansion, enlarging sanitary sewerage sys. $215,000. Ford, Bacon & Davis, 39 Bway., New York, N. Y., engrs. CD 5/16—ENR 5/22.

Alaska, Kodiak—Sewerage sys. $100,000.

Que., Sillery—Sewers, etc. $65,000.

BIDS ASKED

Bids Asked July 28

Ia., West Union—Rebuilding sewage disposal plant, exten. sanitary sewerage sys. $63,300. CD 5/5—ENR 5/8.

Bids Asked

O., Ravenna—W. Zoll, Dir. Pub. Serv., F. G. Browne & Assoc., Marion, consult. engrs. CD 3/17—ENR 3/20.

LOW BIDDERS

Wis., Sheboygan—Sewage screening plant, connecting sewers, from Jacob Houmes, 813 St. Clair Ave. $35,600. CD 6/24—ENR 6/26.

CONTRACTS AWARDED

†**Calif., Riverside**—War Dpt., 20 St. and Constitution Ave. N.W., Wash., D. C., sewage treatment plant, March Field, to Fritz Ziebarth, Long Beach. $174,800.

†**Ill., Fort Sheridan**—War Dpt., 20 St. and Constitution Ave. N.W., Wash., D. C., 5 ton incinerator, to Welso Constr. Co., 2233 W. Grand St., Chicago. $25,845.

N. J., Brant Beach—Long Beach Twp., Township Hall, sanitary sewers, manholes, Ocean Blvd., Hobart, Jeanette and Bayview Aves. WPA. $60,500. W. D. Cougle, 1102 S. Broad St., Trenton, WPA and owner's engr.

N. J., Butler—Sewage treatment plant addn. and imprvs. WPA. $61,222. Est. $60,000. J. F. Sheehan, foot of 5 Ave., Paterson, WPA and owner's engr.

†**N. J., Fort Dix**—War Dpt., 20 St. and Constitution Ave. N.W., Wash., D. C., sewage treatment plant, to Charles S. Moses, Edgewater Park. $129,000.

†**N. J., Fort Hancock (Sandy Hook)**—War Dpt., 20 St. and Constitution Ave. N.W., Wash., D. C., sewage treatment plant, sludge beds and outfall sewer, to Spiniello Constr. Co., 437 Riverside Ave., Newark. $199,302.

N. J. Hammonton—Atlantic Co., Courthouse, Atlantic City, drainage sys. various streets, WPA. $63,000. CD 6/19—ENR 6/26.

N. J., Plainfield—Sanitary sewers, recaulking joints in existing sewers, Sect. 2. WPA. $61,400. CD 6/18—ENR 6/26.

N. J., Trenton—Hamilton Twp., Township Hall, Greenwood Ave., vitr. clay sewers, house connections, Arbon Terrace, Hollywood and Brombly Sts. WPA. $63,578. W. D. Cougle, 1102 S. Broad St., Trenton, WPA and owner's engr.

Pa., Phila.—Dpt. P. Wks., Bureau Eng., City Hall Annex, sewers Bingham St. and 70 Ave. to D and C. Spinosa, 2 N. Jerome St., $34,000; Devon, Ella and 12 Sts., to M. P. Ventresca, 820 E. Haines St., $27,000.

†**Tex., San Antonio**—Con. Q.M., Fort Sam Houston, sewage disposal plant, Dodd Field, to E. L. Dalton, Great Natl. Life Bldg., Dallas. $36,545.

Tex., Waco—Storm sewer, to L. P. Reed, Meridian, $36,000.

Wis., Sheboygan—Sewage screening plant, connecting sewers, to Jacob Houmes, 813 St. Clair Ave. $35,600. A. L. Boley, city engr. Bids 7/1.

Ont., Fort Erie—Wartime Housing, Ltd., 55 York St., Toronto, sewers, watermains, to Russell Constr. Co. Ltd., Harbour Commissioner's Bldg., Toronto. $50,000.

BRIDGES GRADE CROSSINGS

PROPOSED WORK

Conn., New Haven—City, Eng. Dpt., Hall of Records, rejected bids June 25, repairing, altering Grand Ave. Bridge. $50,000. CD 6/30—ENR 7/3 under LB.

Illinois—State Dpt. P. Wks. & Bldgs., Div. Hys., Springfield, overcrossing Illinois Terminal R.R. near village Wood River, Madison Co. E. Lieberman, Centennial Bldg., Springfield, engr.

Illinois—State Dpt. P. Wks. & Bldgs., Div. Hys., Springfield, bridge to carry FA Route 179 over tracks C., B. & Q. R.R. E. Lieberman, Centennial Bldg., Springfield, engr.

†**Illinois**—War Dpt., Wash., D. C., railroad bridge over Alton R.R. tracks and over U.S. Route 66 A, as part short line of railroad proposed to link Elwood and Kankakee ordnance plants.

Oklahoma—State Hy. Dpt., Oklahoma City, preliminary plans new bridge over Crutcho Creek on farm to market road, near Marion, $25,000. V. T. Moon, Oklahoma City, engr.

Pa., Morrisville—State Hy. Dpt., Harrisburg, removing West Bridge St. canal bridge and build new one. $40,000. CD 9/18—ENR 9/26.

Wisconsin — State Hy. Comm., Madison, Bridge 796, 2 span I-beam bridge with concrete substructure, Cazenovia-LaValle Rd., Sauk Co.; Bridge 775, 3 span continuous I-beam, Spring Valley-Menomonie Rd., Spring Valley North Co. line Rd., Pierce Co.; Bridge 659, 29 ft. span, concrete, steel superstructure on timber abutments, Palmer Lake-Spring Lake Rd.; Helen Creek Bridge, Vilas Co.; high truss bridge, approaches, 0.777 mi. Lone Rock Bridge, Iowa, Richland and Sauk Counties.

N. S., Halifax—Bridge over Halifax and Southwestern Railway. $40,000. R. M. Mackinnon, City Hall, engr.

Que., Masse — Province of Quebec, Quebec City, bridge over Mistigouche River. $30,000. E. Gohier, Dpt. Roads, Quebec City, engr.

BIDS ASKED

Bids Asked July 23

Colorado—State Hy. Dpt., Denver, steel, concrete bridge and incidental approaches, 0.227 mi. hy. between Denver and Arvada, State Hy. 121, Jefferson Co. C. D. Vail, State Office Bldg., Denver, engr.

Bids Asked July 24

†**Colorado** — Bureau Reclamation, Denver, furnishing, del. structural steel for temporary bridge over diversion channel, Green Mountain Dam, Colorado Big Thompson Project, Spec. 1531-D.

Bids Asked July 25

Kansas—State Hy. Dpt. at office Co. Clk., Stockton, continuous rein.-con. slab spans, Bridge 7.6, FA 143; Bridge 8.4, FA 143; Bridge 9.6, FA 143, all foregoing Morton Co.

Missouri—State Hy. Comn., Jefferson City, one 40 ft. I-beam span bridge over stream, Route 13, Proj. FA 335 D2, widening, reconstructing five 40 ft. I-beam span bridge over west fork of Crooked River, Route 13, Proj. FA 335 D-2, six 40 ft. I-beam span bridge over Crooked River, Route 13, Proj. FA 335 D-2, all foregoing on Knoxville-Richmond Rd., Ray Co.; three 25 rein.-con. slab spans, over Drainage Ditch #1, Dist. #3, Route 60, Proj. FA 5-21, Morehouse-Sikeston Rd., Scott Co.; one 20 ft. rein.-con. slab span, culvert type bridge over Malden Creek, Route Srm, Proj. FAS 493 E1, Route 31 AP to Clinton Co. Rd., Buchanan Co.; two 10 ft. rein.-con. slab span, culvert type bridge over branch of Coon Creek, Route SK-Route 6 Rd., Route SB Sect. 2A, Daviess Co.; two 10 ft. rein.-con. slab span, culvert type bridge over Goddard Creek, Route SC Proj. FAS 453 E1, Bevier-College Mound Rd., Macon Co.; widening, reconditioning seven 45 ft. I-beam spans, over overflow of East Fork of Chariton River, one 75 ft. I-beam span and widening, reconditioning two 40 ft. I-beam spans, over East Fork Chariton River, both on Route 24, Proj. FA 44A2, Randolph Co. C. W. Brown, Jefferson City, engr.

Bids Asked July 29

Kansas—State Hy. Dpt. at office Co. Clk., Ulysses, piers and steel I-beam girder for bridge reconstruction, K6048, Grant Co.

Bids Asked

Wis., Racine—H. A. Nelson, comr. P. Wks., repairing west 6 St. viaduct, $49,700. J. W. Beaugrand, city engr.

LOW BIDDERS

†**California** — Pub. Roads Administration, Federal Office Bldg., San Francisco, July 1, bridges, box culvert and 0.38 mi. approach road, Sect. C, Route 11, Lava Bed National Forest Hy., Modoc Co., from Siemer & Caracano, 128 Calumet Ave., San Anselmo. $28,529. CD 6/18.

Calif., Los Angeles—State Hy. Dpt., 808 State Building, July 3, 3 rein.-con. bridges over Ramona Blvd., Pomeroy, Cornwell and Soto Sts., from Nick Percallo, 938 N. Baudry St., Los Angeles. $227,920. CD 6/16—ENR 6/19.

Calif., San Margarita—C. H. Purcell, state hy. engr., Sacramento, July 2, rein.-con. slab bridge, grading, surfacing, from D. Caputo, 985 Delmas Ave., San Jose. $25,817. CD 6/16—ENR 6/19.

Florida — State Road Dpt., Tallahassee, July 9, overpass, FAP FAGS 17-A(1), Rd. 2, Polk Co., and overpass, FAP, No. FAGM 170-A(2), (OFF), Rd. 2, Sumter Co., from Powell Bros., Inc., Fort Lauderdale, $119,422 and $124,953, respectively.

New Jersey—E. D. Sterner, comr. State Hy. Dpt., Trenton, July 11, Riverview Drive grade crossing, Passaic Co., from Franklin Contg. Co., 20 Washington Pl., Newark, $171,352. Rejected bids July 11, reconstructing underpass at Pennsylvania-Reading Seashore Lines, Gloucester Co. CD 6/25—ENR 7/3.

South Dakota—State Hy. Comn., Pierre, July 8, 315 ft. bridge, Spink Co., from J. C. Sorenson, Trent, $41,575.

CONTRACTS AWARDED

Georgia — State Hy. Dpt., Atlanta, superstructure bridge, Wilcox and Dodge Counties, to H. G. Smith, Fitzgerald, $89,043; overhead bridge and surface treated approaches, Wilkinson Co., to John Monaghan, Inc., Pelham, $75,387. Bids 6/27. CD 6/16—ENR 6/19.

Ill., Dayton—La Salle Co., Ottawa, G. L. Farnsworth, supt., three 120 ft. spans over Fox River, to W. J. Howard, Inc., 35 E. Wacker Dr., Chicago, $43,327.

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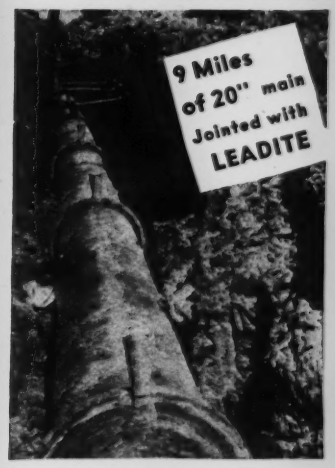

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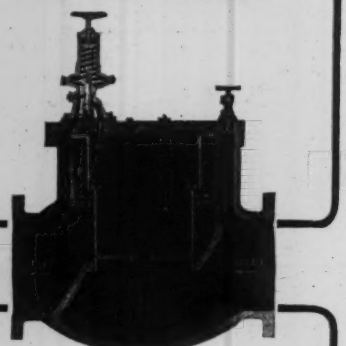

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BRIDGES, etc. (Contracts Awarded, Cont'd.)

†Ill., Fort Sheridan—War Dpt., 20 St. and Constitution Ave. N.W., Wash., D. C., rein.-con. bridge, to Thomas McQueen, 1313 Circle, Forest Park, Chicago. **$53,100.**

Oklahoma—State, State Hy. Comm., Oklahoma City, 6 rein.-con. bridges, Leflore Co., to Merveldt & Stebbins, El Reno. **$64,309.** Est. $70,000. CD 6/23—ENR 6/26, under Roads.

Oklahoma—State Hy. Dpt., Oklahoma City, overpass, Ottawa Co., to El Reno Constr. Co., El Reno, **$106,893** est. $142,500 *** overpass, Muskogee Co., to Ottinger Bros. Co., Hinton, **$102,964** est. $136,000***underpass, Wagoner Co., to O. J. Pharoah, Henryetta, **$66,167** est. $82,000***underpass, Atoka Co., to C. K. Howard & Co., Majestic Bldg., Oklahoma City, **$99,004** est. $144,000. Grand total $375,028. CD 6/11—ENR 6/19.

Pa., Pittsburgh—Bd. Comrs. Allegheny Co., R. G. Woodside, controller, Court House, repaving Liberty Bridge, over Monongahela River, to Harrison Constr. Co., 1101 Western Ave. **$278,426.** Bids 6/17. CD 5/27—ENR 6/5.

South Dakota—State Hy. Comm., Pierre, 315 ft. I-beam bridge, Spink Co., to J. C. Sorenson, Trent, **$41,576.**

N. B., Chatham—Province of New Brunswick, Frederickton, bridge, Morrison Creek, Northumberland Co., to M. Fletcher, Main St., Barker's Point. Est. **$25,000.** CD 6/13.

Que., Montreal—Canadian National R.R., 360 McGill St., concrete viaduct, Pointe St. Charles Rd., to Kennedy Constr. Co. Ltd., 407 McGill St. Est. **$200,000.** A. B. Ferguson, ch. engr.

Que., Point St. Charles—Canadian National Rys., 360 McGill St., Montreal, H. A. Dixon, ch. engr., concrete viaduct, to Kennedy Constr. Co., Ltd., 407 McGill St., Montreal. **$200,000.**

STREETS AND ROADS

BIDS ASKED

Bids Asked July 21

N. Y., New York—Comr. Parks, at office Dpt. Parks, Arsenal Bldg., Central Park, 64 St. and 5 Ave., sheet asphalt paving East Dr. in Central Park, from E. 59 St. and 5 Ave. to 74 St. Contr. M-10-141; bituminous macadam repaving Bronx Whitestone Parkway, between 26 Ave. and Northern Blvd., Contr. Q-125-141, Queens Boro.

Bids Asked July 22

N. Y., Brooklyn—President Brooklyn Boro, Boro Hall, permanent asphalt paving Troy Ave. E. 45 E. 89 and 85 Sts.

Maryland—State Rds. Comn., Baltimore, bituminous surfacing 2.6 mi. Greenbackville Rd., Worcester Co.; concrete surfacing 0.44 mi. dual highway along exten. Connecticut Ave. between Chevy Chase Lake and Jones Mell Rd., Montgomery Co.

N. J., Hillside—Grading, rein.-con. surfacing, North Union Ave. H. Kreh, Jr., 433 N. Broad St., Elizabeth, engr.

Ohio—State Highway Dpt., Columbus, grading, widening, asphaltic concrete resurfacing 0.635 mi. Sect. Waynesville SH 6 US 42, Warren Co. $8,220; 5.069 mi. Sect. A SH 187 U.S. 68, Champaign Co. $57,000; widening with bituminous macadam premixed base, bituminous road mix resurfacing 9.144 mi. Sects. K, L-1 and L-2 Nashville and J, SH 145, Holmes Co. $39,800; drainage structures, hot mixed hot laid asphaltic concrete resurfacing 1.293 mi. Sect. Van Wert, SH 2727 and 419 US 127 and 30, Van Wert Co. $30,700; bituminous treatment 47.8 mi. Sects 97, 144, 146, 147, 454, 139, 643, 417, Ashland, Medina and Wayne Counties $72,408; 31.06 mi. SH 15, 475, 151, 152, 13, 476 and 444, Ashtabula Co. $44,947; 43.93 mi. Sects. 410, 527, 1, 26, 107, 349, 484, 605, 513, Coshocton, Guernsey and Muskingum Counties, $36,985; 70.74 mi. Sects. 339, 443, 719, 23, 575, 653, and 979 Coshocton, Knox and Licking Counties, $61,967; 35.25 mi. Sects. 490, 199, 485, 644, 204, 148, 205 and 478, Crawford and Richland Counties, $49,901; 27.99 mi. Sects 327, 153, 651, 885, 16 and 826 Geauga and Lake Counties, $39,031; asphaltic concrete resurfacing 0.56 mi. Sect. Ashland SH 139, 140 and 142 US 42 and 250, Ashland Co., $10,650; tar concrete resurfacing 2.042 mi. Sect. D. SH 86, SR 169 and Sect. D. SH 89, Columbiana Co., $16,400.

West Virginia—State Road Comm., Charleston, surface treatment 5.3 mi. Ruth-Alum Creek Rd., S.P. 3483, Kanawha Co.; asphaltic concrete surfacing 1.16 mi. U. S. Route 21 and 52 S.P. 3635, Mercer Co.; surface treatment 3.29 mi. Flat Top Yards to Wolfe Rd., P. 3482 and 3482 A & B, 0.8 mi. Cherry St. Cutoff in Bluefield, P. 3560, 2.5 mi. Junction Grassy Branch Cutoff to Virginia State Line Rd., P. 2205, 2.56 mi. U.S. Route 21, P. 269, Mercer Co.; 19.5 mi. Williamson-Matewan Delorme Rd., S.P. 2238, 3731, 2239, Mingo Co.; 9.7 mi. U.S. 52 at Northfork Ashland to Mercer Co. line, S.P. 5462, McDowell Co., 4.4 mi. Cirtsvillet Jct. Sect. 1/11 Secondary Rd. S.P. 5315, 4.41 mi. Surveyor-Eccles Rd. P. 101, Raleigh Co.

Bids Asked July 23

Louisiana—State Hy. Dpt., Baton Rouge concrete paving 5.705 mi. S.P. 913-147 Fed. Aid Secondary Hy. Proj. AW-FAS 59(1), Camp Polk, Int. Route 21, Hy., Route C-2040, Vernon Parish.

N. Y., St. George—President Richmond Boro, Boro Hall, bituminous concrete and asphalt block pavement Townsend Ave., etc.

Bids Asked July 24

N. Y., Kew Gardens—President Queens Boro, Boro Hall, 120-55 Queens Blvd., regulating, grading, regrading, recurbing, etc., 159 St.; Grand Central Parkway, etc.

N. Y., New York—President Bronx Boro, Bronx County Bldg., 851 Grand Concourse, granite block repaving E. 134 St.; sheet asphalt and asphalt block repaving Longwood Ave.; sheet asphalt and brick repaving Longfellow Ave.; brick repaving Gun Hill Rd.

Bids Asked July 25

Georgia—State Highway Dpt., W. E. Wilburn, chn., Atlanta, grading, surface treatment 1.277 mi. Blackshear State Route Pierce Co.; surface treatment, 2 bridges 3.104 mi. Pelham-Moultrie Rd., Mitchell Co.; 8.804 mi. Barnesville-Yatesville Rd., Upson and Lamar Counties; 2.673 mi. Waycross-Alma Rd., Ware Co.; grading, surface treated road, 1 bridge culvert, 7.891 mi. Tifton-Ocilla Rd., Tift Co.; 7.096 mi. and 2 bridges, Statesboro-Sylvania Rd., Bulloch Co.; grading, chert base and 1 bridge, Holland-Summerville Rd., Chattooga Co.; grading, 1 bridge, 4.494 mi. at Bear Creek Luthersville, Turin Rd., Coweta Co.; asphalt surfacing 1.363 mi. Atlanta-Jonesboro Rd., Clayton Co.; grading, concrete paving 2.198 mi. Rome-Summerville Rd., Floyd Co.; paving 4.217 mi. Memorial Hy., DeKalb Co.; 0.676 mi. Forsyth and Crawford Sts. in Americus, Sumter Co.; 5.45 mi. Abbeville-McRae Rd., Dodge Co.; 40.913 mi. Coastal Hy., Savannah, Ga. to Jacksonville, Fla., widening, asphalt surfacing 15.453 mi. Coastal Hy., Savannah, Ga. to Jacksonville, Fla.; lighting sys. on bridge over A. O & C R. R. in Manchester on Manchester Woodbury Rd., Meriwether Co.; new bridge at Ochlochnee River and 0.559 mi. concrete paved approaches Thomasville-Albany Rd., Thomas Co.

Kansas—State Hy. Dpt. at office Co. Clk., Stockton, light type surfacing, grading, culvert 0.755 mi. FA 304 F, Parts 1 and 2; 2.865 mi. FA 565 B, Parts 1 and 2; both Rooks Co.; resurfacing material 14.41 mi. P. 3665, Smith Co.; single asphalt surface treatment 18.872 mi. P. 3666, 3667, 3668, Graham Co.; 15.152 mi. P. 3669 AB, Sheridan Co.; 27.11 mi. P. 3671 ABCD; 14.024 mi. 3670 AB, both Wallace Co.

Minnesota—State Hy. Dpt., St. Paul, gravel surfacing, grading 7.2 mi. State Rd. S. Proj. 34-405-02, FAS 139 B(1), Kandiyohi Co.; grading, crushed rock on sand surfacing 5.2 mi. State Rd. 2 Proj. 50-504-01 FAS 101 C(1), Mower Co. gravel surfacing, bituminous material and mineral aggregate surfacing 4.9 mi. State Rd. 6, Proj. 72-501-04, FAS 73A(2), Sibley Co.; concrete box culvert, 11 mi. Proj. 34-505-03, FAS 139 B(1), Kandiyohi Co.; stabilized gravel surfacing, 1 concrete box culvert 77 mi. S.P. 1203-02 (Trunk Hy. 7-119) and S.P. 2401-01 (TH 7-119), FAGS 188 A(1), and 188 B(1); 43,061 cu. yd. embankment in place 0.4 mi. S.P. 7807-02 (TH 117-193); gravel back fill, gravel surfacing, etc. 13.2 mi. S.P. 6607-12 and 13 (TH 60-21) and S.P. 2511-02 and 03 (TH 60-21), FA Projects 420 B(4), 69 A(3), 420 C(4) and 420 E(3); grading, bituminous material and mineral aggregate surfacing 1.3 mi. S.P. 0111-02 (TH 65-51; binder soil, gravel surfacing, bituminous material, mineral aggregate surfacing 4.7 mi. S.P. 7201-10 (TH 5-121) and S.P. 1001-06 (TH 5-121), FAP 587 B(2); cement, and soil cement base surfacing 6.2 mi. S.P. 4501-09 (TH 1-173) SAP 861 C(2). J. T. Ellison, c/o Owner, ch. engr.

Missouri—State Hy. Comn., Jefferson City, surfacing 2.354 mi. road from Route 169 to Route 31 AP, Route N.N-FAS 493-D(1); 2.368 mi. Route NN-FAS 493-E(1), road from Route 31AP to Clinton Co., both Buchanan Co.; grading, surfacing 1.231 mi. road west of Fairport, Route E-FAS 142 A(1), De Kalb Co.; 0.221 mi. Route D-FAS 138-A(1), road north of Meadville, Linn Co.; 1.61 mi. road from Route H- to Chariton Co., Route E-FAS 1-8-B(1), Livingston Co.; 2.228 mi. Route C-FAS 453-E(1), road from Bevier to College Mound, Macon Co.; 0.64 mi. road from Hunnewell to Monroe Co., Route V-FAS-162-A(1), Shelby Co.; 3.049 mi. road from Shelby Co. south, Route V-FAS 162-B(1), Monroe Co.; concrete paving 2.017 mi. road at old Griwille, Route 69, Sect. 15 C, Wayne Co.; grading, concrete paving 0.023 mi. road from Morehouse to Sikeston, Route 60, FA 5(2), Scott Co.; grading, gravel surfacing 3.445 mi. Road from West Plains to Lanton, Route A-FAS 66-A(1), Howell Co.; 1.288 mi. read from southeast of Lebanon, Route B-FAS 683-C(1), Laclede Co.; Gravel surfacing 4.42 mi. road from Route K southeast, Route A, Sect. 3-B, Stone Co.; grading, aggregate slab, stabilized, bituminous material and bitulithic surfacing 3.963 mi. road from Route 65 to Sparta, Route 14, Sect. 9; 3.484 mi. road Route 65 to Sparta, Route 14, Sect. 1-B; 0.411 mi. road at intersection to Route 14, Route 65, Sect. 101 C, all foregoing Christian Co.; grading 0.221 mi. Route 24-Clifton Hill Route E, Sect. 1, Randolph Co.; surfacing 1.383 mi. Route 14 through Clever, Christian Co.; 4.162 mi. Knoxville-Richmond Rd., Route 13, FA 335-D(2), Ray Co.; grading, concrete paving 1.802 mi. Chariton Co.-Huntsville Rd., 2.718 mi. same road, Route 24-FA 44 A(2), 4.828 mi. same road, Route 24, FA 268 B(1), all foregoing in Randolph Co.; 4.166 mi. Knoxville-Richmond Rd., Route 13-FA 355-B(2),

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STREETS, etc. (Bids Asked, Cont'd.)

4.283 mi. same road, Route 13-FA 335-C(2), both Ray Co.; hauling, dumping, stockpiling crushed stone, 53.2 mi. roads, Division 2, Group 1, Grundy and Mercer Counties; 31 mi. hys. Div. 2, Group 3, Chariton, Linn, Putnam and Sullivan Counties; 112.4 mi. roads Div. 2, Group 4, Adair, Putnam, Schuyler and Sullivan Counties; 132.1 mi. roads, Div. 2, Group 7, Chariton, Linn, Macon and Randolph Counties; hauling, dumping, stockpiling, gravel surfacing 51.3 mi. roads, Div. 2, Group 6, Chariton, Linn and Livingston Counties; 44.1 mi. roads Div. 2, Group 2, Grundy, Sullivan and Putnam Counties; 86.4 mi. roads Division 2, Group 5, Linn, Macon and Sullivan Counties. C. W. Brown, Jefferson City, engr.

Missouri—State Hy. Comn., Jefferson City, hauling, dumping, stockpiling gravel 54.6 mi. roads, Div. 6, Group 7, St. Charles and Warren Counties; 59.2 mi. Div. 6, Group 6, Jefferson, St. Francois and Washington Counties; 64.5 mi. Div. 6, Group 5, Iron, Perry, St. Francois and Ste. Genevieve Counties; 9.9 mi. Franklin, Gasconade and Jefferson Counties; 50.1 mi. Div. 6, Group 3, Crawford, Franklin and Gasconade Counties; 42.7 mi. Div. 4, Group 13, Benton and Henry Counties; 61.6 mi. Div. 4, Group 12, Johnson, Lafayette, Pettis and Saline Counties; hauling, dumping, stockpiling, crushed stone 58.2 mi. roads Div. 4, Group 11, Henry and Johnson Counties; 76.1 mi. Div. 4, Group 10, Cass Co.; 47.5 mi. Div. 4, Group 9, Johnson and Lafayette Counties; 39.8 mi. Div. 4, Group 8, Lafayette County; 61.3 mi. Div. 4, Group 7, Saline Co.; stockpiling gravel or crushed stone 15.4 mi. Div. 4, Group 6, Carroll Co.; hauling, dumping, stockpiling crushed stone 59.3 mi. Div. 4, Group 5, Carroll and Ray Counties; 65.6 mi. Div. 4, Group 4, Clay and Ray Counties; 53.8 mi. Div. 4, Group 3, Clay and Platte Counties. C. W. Brown, Jefferson City, engr.

New Mexico—B. G. Dwyre, engr. State Hy. Dpt., Santa Fe, grading, drainage structures, base course surfacing, double penetration wearing top, 3.556 mi. FAS 214 I(2) and 214 J(1), Santa Fe Co., $60,000; grading, drainage structure, 3 multiple span concrete box culverts, SAP 234 B, Sandoval Co. $135,000.

Pa., Springfield Twp. (Mercer P. O.)—Supervs. Springfield Twp., W. I. Blake, secy., RD 6, Mercer, bituminous on stone paving 7,040 lin. ft. Town Rd. 313, $25,000. L. R. Orr, RD 1, Volant, engr.

Bids Asked July 29

N. Y., Harrison—At office Westchester Cross County Parkway Auth., County Office Bldg., Martine Ave., White Plains, imprv. Hutchinson River Parkway, Contr. HR-2; adv. ENR 7/17.

Washington—R. C. Knapp, dir. State Hy. Dpt., Olympia, clearing, grading, draining, 4 rein.-con. bridges 2 mi. SN-FAP 96(2), Unit 1, clearing, draining, 3 rein.-con. bridges 2.5 mi. SN-FAP 96(2), Unit 2, both King Co.; clearing, grading, draining, surfacing, stockpiling mineral aggregates 1.9 mi. SN-FAP 174-H(1), Klickitat Co.; surfacing, light bituminous surface, nonskid seal treatment 13.9 mi. SH 3, Pullman to Palouse, Whitman Co.; clearing, grading, draining, surfacing, treated pile and timber trestle 1.1 mi. Secondary SH 9-A, Clallam Co.

Wisconsin—State Hy. Comm., Madison, concrete surfacing 6.352 mi. Hicks Corners-Darlington Rd., S.P. 9442 A, Lafayette Co.; grading, draining, roadside treatment 7.366 mi. Madison-Milwaukee Rd. Madison-Lake Mills Rd.; 7.318 mi. Madison-Milwaukee Rd., Madison Lake Mills Rd.; 15.184 mi. Madison-Milwaukee Rd., Madison Lake Mills Rd., all foregoing Dane Co.; grading, draining, graded aggregate surfacing 10.031 mi. Oshkosh-New London Rd., Greenville-New London Rd. Outagamie Co.; grading, draining, surfacing 2.378 mi. Spring Valley-Menomonie Rd., Spring Valley-North Co. Line Rd., Pierce Co.; grading, draining, bituminous surfacing 5.396 mi. Ellsworth-Downsville Rd., Downsville-West Co. Line Rd., Dunn Co.; grading, draining, roadside treatment, gravel surfacing 2.679 mi. Woodruff-Eagle River Rd., St. Germain Lake Eagle River Rd., Vilas Co.; imprv. 0.298 mi. Bloomington Channel change, Grant Co.; sheet asphalt surfacing 0.494 mi. Milwaukee-Jefferson-Madison Rd., Blue Mound Rd., Hawley Rd., 66 Street Sect., Milwaukee Co.

Bids Asked July 30

Louisiana—Dpt. Hys., Baton Rouge, bituminous surface treating 17.1 mi. S.P. 913-04-63, Shreveport-Gilliam Hy., Route 55; 6.9 mi. S.P. 913-04-62, Shreveport-Flournoy Hy., Route 1, both Caddo Parish; bridge over Bayou Teche and approaches, Lewis St., Jeanerette, Route C-1904, S.P. 913-04-83, Iberia Parish; Charenton Bridge over Bayou Tech and approaches, Route 129, S.P. 913-04-84, St. Mary Parish.

Wis., Markesan—R. J. Connolly, village clk., curbing, guttering, sewers, paving Contrs. 1, 2, 3 and 4. General Eng. Co., Portage, engr.

Bids Asked August 1

Kentucky—State Hy. Dpt., Frankfort, grading, draining, low type surfacing 3.555 mi. Shepherdsville-West Point Rd., Bullitt and Jefferson Counties; 4.632 mi. Harlan-Hyden Rd., Leslie Co.; 5.429 mi. S.P. 91-179, Nicholas Co.; 2.536 mi. Felmingsburg-Charters Rd., Fleming Co.; bituminous surfacing 4.1 mi. Campbellsville-Mansville-Liber[illegible] Rd., Taylor Co.; 10.427 mi. Kuttawa-Fre[illegible]ia Rd., Lyon and Caldwell Counties; mediu[illegible]type surfacing 10 mi. Albany-Burkesville [illegible] Clinton and Cumberland Counties; 10 mi. [illegible]amestown-Albany Rd., SP 104-78, Russell [illegible]

Tennessee—State Hy. Dpt., [illegible]sville, grading, drainage 2.429 mi. P[illegible]96-1, Putnam Co.; 2.449 mi. State Route 85, [illegible]383-1, Overton Co.; 13.336 mi. P. 3961-[illegible] Hardeman Co.

Bids Asked August [illegible]

Louisiana—Dpt. Hys., Baton Rouge, blacktopping 13.8 mi. Dixie Inn-Cotton Valley Rd., Webster Parish. $130,000.

Bids Asked

★**Ohio**—State Hy. Dpt., Columbus, received no bids July 8, imprv. 5.537 mi. Portage and Trumbull Counties, $655,000; 34.4 mi. Holmes and Tuscarawas Counties, $446,[illegible]; 1.278 mi. Lawrence Co., $47,750; 9.398 mi. Carroll and Stark Counties, $[illegible]. CD 6/26—ENR 7/3.

South Dakota—State Hy. Comm., Pierre, rejected bids June 24 imprv. SN FAGH 46 B(1), Custer Co.; SN FAP 447 C(1), Pennington and Custer Counties; resealing FAP 22 Reop. and 22 Reop., Edmunds and Day Counties; FAP 50 A & B Reop. and 92 Reop., Sanborn and Miner Counties; FAP 82 Reop. and 183 A Reop., NRM 8 (1935), Brookings, Beadle and Deuel Counties; FAP 177 B Reop., Pennington Co. CD 6/11—ENR 6/19.

Virginia—State Hy. Dpt., Richmond, rejected bids July 1, imprv. 3.47 mi. Warwick Co.; 1.8 mi., 0.03 mi. and 1.47 mi. Henrico Co. CD 7/3—ENR 7/10, under LB

LOW BIDDERS

†**Alabama** — Pub. Roads Administration, Winder Bldg., Wash., D. C., July 1, imprv. 5.087 mi. roads, Ala. Forrest Hy. Project 10-A Black Warrior National Forest, Winston Co., from Mitchell Bros. Constr. Co., 388 S. 2 St., Birmingham. **$200,239.** CD 6/16—ENR 6/12

†**Ark., Dyess**—Farm Security Administration, Donaghey Bldg., Little Rock, grading, boxing roads, from W. P. Mc George Constr. Co., foot Neb. St., Pine Bluff. **$156,000.**

California—C. H. Purcell, engr. State Hy. Dpt., Sacramento, July 2, imprv. 2.7 mi. Santa Clara Co. and 10.4 mi. Contra Costa Co., from L. J. Immel, Box 65 Station A, Berkeley, **$25,564** and **$194,315** respectively*** 2.9 mi. Placer Co., from Hayward Bldg. Material Co., Atherton and Jackson Sts., Hayward. **$25,215.** CD 6/16—ENR 6/19.

★**Florida**—State Road Dpt., Tallahassee, T. A. Johnson, chn., July 9, concrete paving, bridges, 8½ mi., Rd. 21, FA 117-A(1), operating No. 3150, Volusia Co., from M. J. Carroll Constr. Co., Leesburg. **$724,408.** J. H. Dowling, Tallahassee, state hy. engr.

Florida—State Road Dpt., Tallahassee, July 9, imprv. 10.23 mi. S.P., Hillsborough Co., from Cone Bros. Constr. Co., Caesar and Walton Sts., Tampa, **$32,115***22.16 mi., Hernando and Pasco Counties, from W. L. Cobb Constr. Co., 1 Ave. and 22 St., Tampa, **$46,419***12.99 mi. Manatee, Sarasota and Highlands Counties, from McFarlin Constr. Co., Ponce de Leon Blvd., Coral Gables, **$35,669***14.101 Washington Co., from Coggin & Deermont, Chipley, **$29,922.**

†**Ill., Savanna**—War Dpt., 20 St. and Constitution Ave. NW., Wash., D. C., bituminous roads, Savanna Ordnance Depot, from Rock Road Constr. Co., 5915 W. Rogers St., Chicago, **$67,000.**

★**Kentucky**—State Hy. Dpt., Frankfort, July 9, imprv. 4 mi. Breckenridge Co., from R. E. Gaddie & Co., Bowling Green, **$39,451***4.458 mi. Bullit and Nelson Counties, from R. E. Waters, Elizabethtown, **$45,435***4.244 mi. Carter Co., and 6.136 mi. Fleming and Lewis Counties, **$41,774** and **$46,426** respectively***4.45 mi. Daviess, from R. M. Robinson, Owensboro, and J. B. Towles, Lexington, **$41,346***0.612 mi. Franklin Co., from Harry Hatfield & Co., Barboursville, W. Va., **$65,835***0.665 mi. Franklin Co., from Kentucky Road Oil Co., Frankfort, **$99,322***7.835 mi. Franklin and Shelby Counties, from Codell Constr. Co., Winchester, **$343,621***14.41 mi. Garrard Co., and 8.408 mi. from Breslin Constr. Co., contractors Midwest Bldg., Louisville, Ky., and White Consolidated, Inc., 1735 W. Fullerton St., Chicago, Ill., **$30,658** and **$31,578** respectively***7.814 mi. Hardin Co., from W. C. and A. Snider, Danville, and Nally & Mudd, Springfield, **$140,902***14.727 mi. Lewis Co., from Portsmouth Sand & Gravel Co., Portsmouth, O., **$55,210***6.371 mi. Logan Co., from J. F. Mulligan, Inc., Greenville, **$56,457***2.327 mi. Marion Co., from Nally & Mudd, Springfield, **$53,413.** CD 6/20—ENR 6/26

Louisiana—State Dpt. Hys., Baton Rouge, July 2, imprv. 3.957 mi. Terrebonne Parish from Central Constr. Co., Inc., Monroe, **$165,267.** CD 6/12—ENR 6/19.

†**Me., Kittery**—Pub. Wks. Officer, Portsmouth, N. H., July 7, road and walks, Navy Housing, Spec. 10394, from Warren Bros. Road Co., 38 Memorial Dr., Cambridge, Mass., **$123,000.** CD 7/3.

Maryland—State Rds. Comm., Baltimore, July 8, imprv. 2.348 mi. Frederick Co., from M. J. Grove Lime Co., Lime Kiln, **$140,436**; 3.909 mi. Charles Co., from Pembeck & Gasparovic, Great Mills, **$257,194.** CD 7/1

Minnesota—State Comr. Hys., State Hy. Dpt., St. Paul, June 20, imprv. 6 mi. SP

STREETS, etc. (Low Bidders, Cont'd.)

7702-06 (TH 10-2) FAP 348 A(4), from H. B. Lund & Son, Thief River Falls. **$88,877.** CD 6/4—ENR 6/12.

New Jersey—E. D. Sterner, Comr. State Hy. Dpt., Trenton, July 11, imprv. 2.84 mi. Hunterdon Co., from Louis Sodl, 1 South Main St., Lambertville, **$85,806.** CD 6/25—ENR 7/3.

N. J., Jersey City—Hudson Co., Courthouse, repairs, patching, asphalt on concrete surfaces roads, from Clinton Asphalt Co., 308 15 St., Union City, **$35,550.** F. Radigan, Courthouse, Jersey City, engr.

N. J., Trenton—Mercer Co., paving Liberty St. from G. C. Cochran, Frazer St. **$30,507.**

North Dakota—State Hy. Comm., J. S. Lamb, Bismarck, July 11, imprv. 19.3 mi. Stutsman Co., from W. H. Noel Co., Jamestown, **$162,115**; 13.5 mi. Ward and McLean Counties, from Northwestern Eng. Co., Rapid City, **$48,024.** CD 7/2.

Ohio—State Hy. Dpt., Columbus, July 1, imprv. 40.31 mi. Portage Co., from Ohio Road Imprvt. Co., 30 E. Broad St., Columbus. **$37,735.** Est. $39,603. CD 6/20—ENR 6/26.

★**Pennsylvania**—At office I. Lamont Hughes, secy., Hy. Dpt., Harrisburg, July 11, imprv. 3.804 mi. Northampton Co., from C. Riebe, Lansford, **$37,687*****22,009 ft. McKean Co., from Putman & Greene, Inc., 296 Transfer Bldg., Fort Wayne, Ind., **$198,036*****9.976 ft. Northampton Co., from Hutchinson Contg. Co., W. Madison Ave., Clifton Heights, **$61,874*****656 ft. Cambria Co. from L. J. Luteri, 464 W. Patriot St., Somerset, **$30,874*****32,900 ft. Schuylkill and Carbon Counties, from J. H. Swanger, Breneman Bldg., Lancaster, **$370,829*****5,150 ft. Washington Co., from F. O. Patterson, 1 St. and Meldon Ave., Donora, **$150,262*****19,037 ft. Bedford Co., from Walker Bros., 36 Hood St., Chambersburg, **$284,770*****1,533 ft. Blair Co., from Chestnut Hill Contg. Co., P. O. Box 4323, Chestnut Hill, **$43,933.** CD 7/2.

†**S. C., Columbia**—Office Con. Q.M., Fort Jackson, June 27, road work, Inv. M 6403-41-51, from C. G. Fuller, Barnwell, **$131,650.**

South Dakota—State Hy. Comn., Pierre, July 8, imprv. 6.495 mi. Lawrence Co., from Inland Constr. Co., 3867 Leavenworth St., Omaha, Neb., **$33,219*****10.971 mi. Lawrence Co. and 12.043 mi. Butte and Lawrence Counties, from Peter Kiewit Sons Co., 1024 Omaha Natl. Bank Bldg., Omaha, Neb., **$62,972** and **$82,144** respectively***6.235 mi. Gregory Co., from N.W. Engineering Co., Rapid City, S. D., **$44,317*****8.882 mi. Spink Co., from S. E. Gustafson Constr. Co., Beresford, **$39,915.** CD 6/25.

Wash., Yakima—Yakima Co. Comn., Courthouse, July 7, oiling 34.4 mi. road from Diegel Oil Sales Co., 2155 Northlake Ave., Seattle. **$51,135.** CD 6/25.

★**Wisconsin**—State Hy. Comm., Madison, July 8, imprv. 5.849 mi. Adams Co., from J. R. Griffith Co., Racine, **$222,221*****12.761 mi. Bayfield Co., from Victor Nelson, Superior, **$257,923*****0.926 mi. Vernon Co., from Otto Sanders, Mt. Horeb, **$32,199*****4.441 mi. Clark Co., from H. Turner & Son, Boscobel, **$84,750*****9.344 mi. Grant Co., from E. & C. Co., Milwaukee, **$60,004*****2.654 mi. Taylor Co., from L. G. Arnold, Inc., Eau Claire, **$58,603*****1.785 mi. Marathon and Taylor Counties, from C. and J. Theiler, Tomahawk, **$40,806*****1.754 mi. Florence Co., from R. B. Vickery & Co., Suamico, **$40,448.** CD 6/19 and 6/24—ENR 6/26.

CONTRACTS AWARDED

Arkansas—State Hy. Dpt., Little Rock, black top Highway 24 between Nashville and Leakesburg, **WPA. $121,231.** W. W. Zass, Little Rock, engr.

Ark., Malvern—K. K. Knight, mayor, paving, **WPA. $50,000.** Dickinson and White, Rector Bldg., Little Rock, engrs.

†**Calif., Presidio of Monterey**—Con. Q.M., Fort Ord, paving Presidio of Monterey and constructing rein.-con. apron, to F. J. Twaits Co. & Morrison-Knudsen Co., Inc., 816 W. 5 St., Los Angeles, Calif., **$30,200.**

†**Colo., Denver**—U. S. Eng., 1709 Jackson St., Omaha, Neb., roads and walks, Lowry Field, to Peter Kiewit Sons Co., Omaha Natl. Bank Bldg., Omaha, Neb. **$188,525.** Bids 6/21. CD 6/17.

★**Georgia**—State Hy. Dpt., Atlanta, to John Monaghan, Inc., Pelham, imprv. 5.4 mi. Coweta Co. **$26,267.** 3.031 mi. Henry Co. **$50,-104,** 5.102 mi. Berrien Co. **$33,712*****to C. M. Lyle Constr. Co., Gainesville, 5.36 mi. Lumpkin Co. **$93,940*****to Campbell Constr. Co., 1312 10 Ave., Columbus, 4.79 mi. Webster Co. **$74,414*****to M. R. Woodall Co., Inc. 1594 Lakewood Ave. S. E. Atlanta, 7,067 mi. Jones and Wilkinson Counties **$104,209*****to Coffee Constr. Co., Eastman, 11.202 mi. Johnson Co. **$73,235*****to Whitley Constr. Co., LaGrange, 2.784 mi. Dodge Co., **$56,166.** Grand total $516,047. Bids 6/27. CD 6/16—ENR 6/19.

†**Ga., Fort Benning**—War Dpt., 20 St. and Constitution Ave. N.W., Wash., D. C., road surfacing, to Hugh McMath, 1520-1 Ave., Columbus, Ga., **$76,641.**

Ill., Elwood—Bituminous surfacing 33 mi. roads at Ordnance Plant, to Rock Road Constr. Co., 5915 Rogers Ave., Chicago. **$186,-800.**

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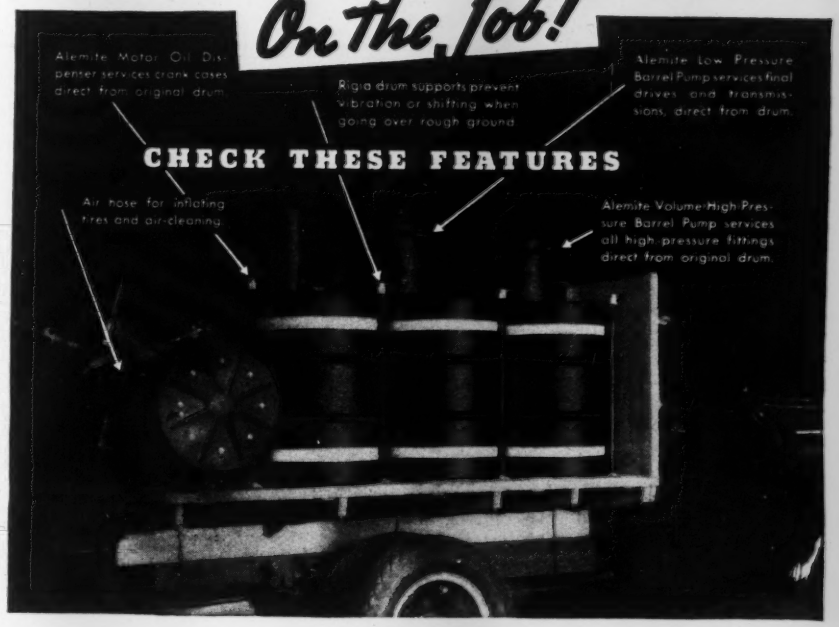
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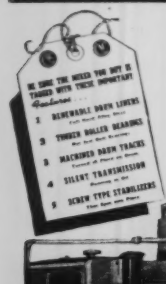
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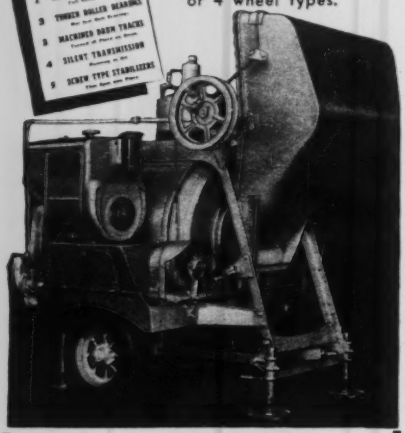

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STREETS, etc. (Contracts Awarded, Cont'd.)

Ill., Geneva—Kane Co., C. L. Hanson, supt., bituminous surfacing highway, to Geneva Constr. Co., Aurora. **$29,806.**

†Ill., Rockford—Con. Q.M., bituminous roads at Camp Grant, to Arrow Petroleum Co., 7419 Franklin, Forest Park, Chicago, **$33,336.**

Ill., Shelbyville—Shelby Co., imprv. roads. **WPA. $357,354.**

Ia., Akron—Alvin Manning, city clk., grading, paving streets, to Harco Constr. Co., Sioux City. **$59,448.** Bids 6/25.

Ia., Eldora—Hardin Co., graveling 45 mi. roads, resurfacing 83 mi. roads, to H. C. Young, Des Moines, **$30,515.**

Kansas—State Hy. Dpt., at office Co. Clk., Dighton, imprv. 22.262 mi. Kearny Co., to C. Hulme, Great Bend, **$26,086;** 8.078 mi. Ness Co., to L. F. Harper, Great Bend, **$25,435.** CD 6/11—ENR 6/19.

Kansas—State Hy. Dpt., at office Co. Clk., Topeka, imprv. 0.568 mi. Shawnee Co., to Stannard Constr. Co., 428 N.R.I., Wichita, **$84,523;** underpass, Shawnee Co., to Cook and Tucker, Ottawa, **$104,113.** Bids 6/26, awarded 7/5. CD 6/17—ENR 6/19.

Kansas—State Hy. Dpt., at office Co. Clk., Washington, imprv. 5.919 mi. Washington Co., to Concrete Materials & Constr. Co., Cedar Rapids, Ia. **$48,637.** Bids 7/8, awarded 7/10. CD 6/26—ENR 7/3.

†Kan., Fort Riley—War Dpt., 20 St. and Constitution Ave. N.W., Wash., D. C., 26 mi. concrete, bituminous macadam and armor coat on interior roads in vicinity of post, to San-Ore Constr. Co., McPherson, and M. W. Watson, Natl. Bank of Topeka Bldg., Topeka. **$364,590.**

Kan., Newton—N. R. Rafferty, city clk., resurfacing streets, reconstructing paving, to Rhoades Constr. Co., Newton. **$60,840.** Est. $60,000. Bids 7/2. CD 6/25.

†Ky., Fort Knox—Con. Q. M., bituminous surfacing roads, to Highland Co., Inc., 644 Baxter St., Louisville, Ky., **$135,500.** Bids 6/12. CD 6/5.

★**Louisiana**—Dpt. Hys., Baton Rouge, imprv. 6.755 mi. Caddo Parish, to Central Constr. Co., Monroe, **$535,437.** CD 6/3—ENR 6/7 under LB.

Md., Baltimore—Sheet asphalt paving Frederick Ave., to Baltimore Asphalt Block & Tile Co., 1320 N. Monroe St., **$54,442.** CD 6/23—ENR 6/26.

Minnesota—State, Comr. Hys., State Hy. Dpt., St. Paul, imprv. 4.7 mi. S. P. 4006-04 (Trunk Hy. 60-60) FAP 68 C(1), to A. T. Nolan, 20 N. 2 St., Minneapolis, **$69,896***** 15.5 mi. S. P. 5803-03 -04-05, and 06, TH 23-185, SN-FAP 503 A(2) 503 B(3) 503 D(2) and 503 G(3), to J. W. Craig Co., 1814 California St. E., Minneapolis, **$102,366.** CD 6/4—ENR 6/12.

Missouri—State Hy. Comn., Jefferson City, imprv. 4.155 mi. Cassville-Washburn Rd., Route 37-FA 154 B(2), changed to State Project Sect. 8 B, Barny Co., to Bridges Asphalt Paving Co., 1411 Central Industrial Dr., St. Louis, **$25,857.** Bids 6/27, awarded 7/12. CD 6/17—ENR 6/19.

Mo., Clinton—Vance Julian, city clk., grading, paving, curbing, guttering, **WPA. $50,000.** Shockley Eng. Co., 800 Graphic Arts Bldg., Kansas City, Mo., engr.

Mo., Hermann — Grading, paving 20,000 sq. yd. streets, **WPA. $80,000.**

†Mo., Rolla—Con. Q.M., Fort Leonard Wood, 59,000 sq. yd. concrete paving, to Tobin Quarries, Inc., 1 and Everett Sts., Kansas City, Mo., **$156,500.** Bids 6/26. CD 6/17—ENR 6/19.

†New Hampshire and **Maine**—Con. Q.M., Camp Langdon, Newcastle, constructing various roads, Camp Langdon, Fort Stark, Fort Constitution, Fort Foster, etc., to Guerini Bros., 524 River St., Mattapan, Mass., **$67,900.** Bids 6/27.

†N. J., Clark—Federal Work Agency, 7 and D Sts. S.W., Wash., D. C., 30,000 ft. concrete curbs, 26,000 sq. yd. bituminous concrete surfacing, **WPA. $59,000.** J. H. Weitzen, Smith and Hobart Sts., Perth Amboy, owner's and WPA engr.

N. J., Cliffside Park—Boro, grading, concrete curbing, sidewalks. **WPA. $92,193.** J. F. Sheehan, foot of 5 Ave., Paterson, WPA and owner's engr.

†N. J., Dover—Navy Dpt., 18 St. and Constitution Ave. N.W., Wash., D. C., regrading, paving existing wagon road, and imprv. Lake Denmark Naval Arsenal. **WPA. $51,752.**

N. J., Elizabeth—Grading, penetration macadam paving, manholes, catch basins, etc. **WPA. $57,000.** J. H. Weitzen, Smith and Hobart Sts., Perth Amboy, WPA and owner's engr.

†N. J., Fort Monmouth—Con. Q.M., paving 7 mi. road, to Kingston Bituminous Product Co., Kingston. **$133,974.** Bids 6/26, awarded 7/6. CD 6/20.

N. J., Hackensack—Bergen Co., Administration Bldg., grading, masonry walls, concrete curbing, etc. roads, **WPA. $61,100.** J. F. Sheehan, foot of 5 Ave., Paterson, WPA and owner's engr.

N. J., Montclair—Grading, penetration surfacing, storm drains, curbing. **WPA. $52,700.** J. B. Hayden, Town Hall, [illegible], WPA and town engr.

N. J., Mt. Holly—Burling[illegible] Co., Court house, grading, modified pene[illegible]on macadam paving, gravel shoulders, 5 [illegible] Lewistown-Juliustown-Chambers Corne[illegible] Rd. **WPA. $79,083.** W. D. Cougle, 110[illegible] Broad St., Trenton, WPA and owner's en[illegible]

N. J., Newark—Street Dpt., [illegible] Hall, grading, concrete base with bitum[illegible]es surfacing, resetting curbs, catch basin[illegible] Market and Washington Sts., **WPA. $57,800.** G. Andrea, City Hall, Newark, WPA and [illegible]owner's engr.

N. J., Newark—Grading, gr[illegible] block pavement, Newark airport. **WPA. $52,123.** A. Armstrong, Administration Bldg., Newark Airport, WPA and owner's engr.

N. J., Raritan and **Woodbridge**—War Dpt., 20 St. and Constitution Ave. N.W., Wash., D. C., grading, constructing roads in magazine area Raritan Arsenal, to Middlesex Concrete Products & Excavating Corp., foot of Berry St., Woodbridge, **$79,587.**

N. J., Trenton—Dpt. Conservation & Development, State House, grad[illegible] gravel fire roads, ditches, etc. **WPA.** $67,000. G. E. Swinton, 930 Atlantic Ave., Atlantic City, WPA and owner's engr.

†N. C., Fort Bragg—War Dpt., 20 St. and Constitution Ave. N.W., Wash., D. C., [illegible] clay gravel roads and 30 mi. sand asphalt pavement, to F. D. Cline, Fairview Rd., Raleigh, and Leon Ellis, Greensboro, approx. **$370,000.** Bids 6/30.

★**†N. C., Wilmington**—Con. Q.M., Camp Davis, road work, to Brown Paving Co., 145 Brevard Court, Charlotte, $344,000. Bids 6/13.

†N. C., Wilmington—Con. Q.M., Camp Davis, road work, to Brown Paving Co., 145 Brevard Court, Charlotte, **$169,761.** Bids 6/30.

North Dakota—State Hy. Comm., Bismarck, imprv. 0.1 mi. Morton Co., to Rue Constr. Co., Bismarck, **$145,121*****17.3 mi. Wells Co., to O'Neil Constr. Co., Havre, Mont., **$89,783***** 5.9 mi. Ward Co., to Inland Constr. Co., 3[illegible] Leavenworth St., Omaha, Neb., **$44,680.** Grand total $278,549. Bids 7/11. Rejected bids July 11, imprv. 14.7 mi. Cass Co., painting bridge, Mercer and McLean Counties. CD 7/[illegible]

★**Ohio**—State Highway Dpt., Columbus, imprv. 0.142 mi. Clinton Co., to R. L. Wheelock, Christiansburg, **$32,025** est. $34,720***3.342 mi. Harrison Co., to W. P. McCarren, Walhounding, **$461,006** est. $535,500***44.99 mi. Allen, Putnam and Van Wert Counties, to L. Cossett, 321 W. Front St., Findlay, **$32,028** est. $33,813***47.43 mi. Carroll, Columbiana, Mahoning and Tuscarawas Counties to Troyer Contg. Co., Metropolitan Bldg., Akron, **$75,970** est. $76,4[illegible]*** 49.86 mi. Defiance, Paulding and Putnam Counties, to Ottawa Tar & Asphalt Co., Ottawa, **$36,135** est. $36,145***37.85 mi. Hardin and Wyandot Counties, to N. S. Constr. Co., Upper Sandusky, **$39,439** est. $40,9[illegible]*** 45.71 mi. Monroe, Noble and Morgan Counties, **$71,337** est. $72,625***33.68 mi. Pike and Ross Counties, to L. P. Cavett Co., 500 Shepherd Ave., Lockland, **$27,250** est. $28,27[illegible] Grand total $775,189. CD 6/26—ENR 7/3.

Ohio—State Hy. Dpt., Columbus, to Manx Bros., Greenville, imprv. 85.6 mi. Auglaize, Darke, and Mercer Counties **$38,535.** Est. $45,567***to Ohio Road Imprvt. Co., 30 E. Broad St., Columbus, 38.29 mi. Trumbull Co., **$36,597.** Est. $38,392; 18.56 mi. Mahoning Co., **$37,728.** Est. $39,743; 55.98 mi. Auglaize and Logan Counties **$27,732.** Est. $28,581***to Hinton and Smalley, Celina, 45.38 mi. Auglaize and Mercer Counties **$41,415.** Est. $44,62[illegible]*** to Walter L. Follmer, P. O. Box 173, Hamilton, 45.43 mi. Butler, Hamilton and Preble Counties **$28,474.** Est. $28,872***to Bowsman Washed Sand and Gravel Co., P. O. Box 566, Troy, **$50,486.** Est. $50,809; 57.63 mi. Champaign, Clark, Logan and Shelby Counties **$36,970.** Est. $37,137***to L. P. Cavett Co., 500 Shepherd Ave., Lockland 38.87 mi. Clinton, Greene and Warren Counties, **$25,684.** Est. $25,772***to Troyer Contg. Co., 266 Metropolitan Bldg., Akron, 19.44 mi. Summit Co., **$27,820.** Est. $28,974. Grand total $351,[illegible] Bids July 1. Received no bids July 1, imprv. 45.56 mi. Clermont, Clinton and Warren Counties, $23,976, rejected bids 141.63 mi. Clermont Co. $30,521. CD 6/20—ENR 6/26

★**Oklahoma**—State Hy. Dpt., Oklahoma City, imprv. 5.8 mi. McClain Co., to Park-Ward Co., 2204 E. 10 St., Oklahoma City, **$76,700,** est. $96,000***6.7 mi. McClain Co., to Smith Bros., Noble, **$82,163,** est. $91,000*** 1.5 mi. Delaware Co., to J. W. Moorman, Clinton, **$360,130,** est. $360,000***7.5 mi. Custer Co., to Ryan & Beekman Co., 1801 E. 9 St., Oklahoma City, **$110,401,** est. $115,000***7.3 mi. Blaine Co., to Richards & Mullinix, 1[illegible] W. 5 St., Oklahoma City, **$77,072,** est. $100,1[illegible] ***grading, concrete overpass, U.S. 81, Canadian Co., to Merveldt & Stebbins, El Reno, **$203,096,** est. $200,453***5.1 mi. Le Flore Co., to J. L. Pool, Fairview, **$43,742,** est. $114,67[illegible]*** 8 mi. Garvin Co., to Midwest Materials Co., Cotton Exch. Bldg., Oklahoma City, **$94,865** est., $120,000***5 mi. Grady Co., to Ottmer Bros. Co., Hinton, **$33,190,** est. $36,700. Grand total $1,081,357. Bids 7/8. CD 6/11—ENR 6/19.

†Oregon — U. S. Eng., 628 Pittock Blk., Portland, roadbed and masonry for relocated Oregon, Pacific & Eastern Railway, Market Rd. 30, Co. Rd. 830, Lane Co., to E. C. Hall Co., Eugene, Sect. 1, **$142,906;** McNutt Bros., Eugene, Sect. 2, **$235,849.** CD 5/13—ENR 5/15.

STREETS, etc. (Contracts Awarded, Cont'd.)

★**Pennsylvania** — State Hy. Dpt., I. L. Hughes, secy., Harrisburg, imprv. 42,360 ft. hy., Berks and Montgomery counties, to C. W. Good, Lancaster, **$668,979.** Bids 6/27, awarded 7/9. CD 7/3—ENR 7/10, under LB.

Pa., Lewisburg—Boro, repaving 47,000 sq. ft. streets, to Livingood and Prosser, Royersford. Est. **$25,000.** Awarded 7/8.

Pa., Pittsburgh—Allegheny Co. Comrs., R. G. Woodside, controller, Court House, Pittsburgh, widening new Texas Rd. and reconstructing Plum Creek Bridge 5, Plum Twp., near here, to John J. Ryan, 4032 Beechwood Blvd., Pittsburgh, Pa. **$34,292.** Bids 6/24. CD 6/9—ENR 6/12.

Pa., Pittsburgh—Comrs. Allegheny Co., A. G. Woodside, controller, relocation, widening Lowrie Run and Mt. Nebo Roads, to M. O'Herron Co., 48 S. 18 St. **$55,850.** CD 6/24—ENR 6/26.

South Dakota — State Hy. Comm., Pierre, imprv. 6.235 mi. Gregory Co., to Northwestern Eng. Co., Rapid City, **$44,318.** Bids 7/8. Rejected bids July 8, imprv. FAP 353 A(2), 353 B(2); FAP SN 15 A(5), both Lawrence Co.; FAP 123 A(3) and SN 163 A(5), Butte and Lawrence Counties; FAGM 95 F, FAP 95 E, both Spink Co.

Tex., Cleburne—Johnson Co., c/o R. Anderson, judge, reconstruction, and imprv. hy. from Cleburne to Alvarado. **WPA. $233,400.**

Tex., Edinburg—Hidalgo Co., road imprvs. **WPA. $428,442.**

★**†Tex., Fort Worth**—U. S. Eng., Citizens Bank Bldg., Denison, clearing, grubbing, grading 1,620,000 cu. yd. bomber assembly plant, Lake Worth, to Three M. Constr. Co., 200 Portwood St., Houston, **$508,600.** CD 7/3—ENR 7/10, under Earthwork.

Tex., Fort Worth—S. H. Bothwell, city mgr., grading, sidewalks, guttering, curbing, surfacing, **WPA. $159,723.** W. O. Jones, city engr.

Tex., Houston — Harris Co., c/o County Judge, concrete paving 5 mi. roads, to Gaylord Constr. Co., 806 Blodgett St., **$154,125.** Est. $165,000.

Washington—J. A. Davis, acting dir. Hys., Olympia, imprv. 79.4 mi. Lincoln, Grant and Douglas Counties, to M. E. Nelson Constr. Co., Inc., Box 37, Tonasket, **$32,770***1.66 mi. Snohomish Co., to E. J. Templeton Co., 2924 Lombard Ave., Everett, **$63,930***1.075 mi. Clallam Co., to L. Colucci o, 512 21 Ave. S., Seattle, **$75,443***5.475 mi. Whatcom Co., to C. V. Wilder Co., 2006 State St., Bellingham, **$125,596.** Grand total $297,739. Bids 7/1. CD 6/17—ENR 6/19.

Wis., Manitowoc—Federal Works Agency, Wash., D. C., pavements, walks, sewers and WW sys., to Bahr Constr. Co., 2204 S. 10 St., **$100,149.** Bids 6/21. CD 6/11.

†Alaska, Sitka—U. S. Eng., Central Bldg., Seattle, Wash., access roads, Naval Air Base, to Elliott & Co., Dexter Horton Bldg., Seattle, Wash., **$98,111.**

Alta., Edmonton—Province of Alberta, Edmonton, rebuilding roads, Lavoy-Innisfree, 12 mi. and between Hardisty and Hughenden, day labor, **$200,000.**

British Columbia—Provincial Govt., Victoria, graveling in vicinity Ponce Coupe and Arras, day labor. **$30,000.** Dpt. P. Wks., Victoria, engrs.

Ont., Cornwall—Glengary and Dundas Co., Cornwall, maintenance and constructing roads, day labor. **$107,500** voted. J. G. Cameron, County Bldg., engr.

Ont., Petawana—Dpt. National Defense, Ottawa, surfacing roads in military area, to M. G. Hanniger & Sons, Brockville Rd., Smiths Falls. **$50,000.**

Quebec—Dpt. Roads, Quebec City, paving 13 mi. Hy. 14, Joliette-Berthier, to Page Equipment and Constr. Co. Ltd., 1407 Craig St., Three Rivers, about **$88,000.** CD 6/20.

EARTHWORK, WATERWAYS

PROPOSED WORK

Calif., Oroville—Pacific Gas & Electric Co., 245 Market St., San Francisco, will not construct diversion dams and intake structures for Cresta and Pulga power plant, on north fork of Feather River, Butte and Plumas Counties. Project abandoned. CD 5/21—ENR 5/29.

★**†Idaho, Weiser**—Bureau Reclamation, Denver, Colo., earthfill dam on Mann Creek, near here, creating 86,000 acre feet reservoir.

Ill., Rock Island—State, Springfield, bids soon seawall, on Mississippi River levee, $100,000.

Ky., Prestonburg—Floyd Co. Fish & Game Assn., 130 ft. dam, 12 ft. high, across John's Creek, 8 mi. northwest of here.

N. J., Clifton—Rubble masonry sidewalks in Weasel Brook. **$31,374.** WPA. J. F. Sheehan, foot of 5 Ave., Paterson, WPA and owner's engr.

N. J., East Orange—Excavating 18,008 cu. yd. from Second River. $31,154. WPA. W. Willegarod, Town Hall, East Orange, town and WPA engr.

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EARTHWORK, etc. (Proposed Work, Cont'd.)

†**New York**—U. S. Eng., Buffalo, N. Y., channel work, etc., Chautauqua Lake, to alleviate flood conditions in Ohio and Mississippi Rivers, incl. sys. of wiers, etc., at upper end 21 mi. lake.

†**N. Y., Dunkirk**—U. S. Eng., Buffalo, dredging, channel imprvs., etc., Dunkirk Harbor (Lake Erie), **$30,000.**

†**Oregon-Washington** — U. S. Eng., Pittock Blk., Portland, Ore., dredging Columbia River between Bonneville, Ore., and Vancouver, Wash. **$45,000.**

†**Washington**—U. S. Eng., Pittock Blk., Portland, Ore., dredging Columbia River and tributaries above Celilo Falls to mouth of Snake River. **$39,000.**

†**Washington**—U. S. Eng., Pittock Blk., Portland, Ore., dredging Bay Center in Willapa Harbor. **$30,000.**

W. Va., Boomer—Standard Oil Co. of New Jersey, Boomer, W. Va., and Flemington, N. J., dredging 10,000 cu. yd. harbor and marine facilities on right bank Kanawha River, Boomer Plant. Over **$15,000.**

BIDS ASKED

Bids Asked July 25

†**Idaho, Home Mountain**—Bureau Reclamation, Denver, Colo., furnishing materials for steel warehouse at Anderson Ranch Dam, Boise Project, Spec. 1530. Erection by Government.

Bids Asked July 28

†**Louisiana**—U. S. Eng. Office, foot of Prytania St., New Orleans, dredging, disposing approx. 325,000 cu. yd. material from Bayou Lafourche in Mississippi-Atchafalaya section Intracoastal Waterway between Lockport and Larose.

†**Mont., Fallon**—Bureau Reclamation, Denver, Colo., furnishing, del. 2,300 volt motor control equip., for Fallon and Fallon Relief pump. plants, Buffalo Rapids Project, Spec. 1532-D.

Bids Asked July 29

†**Arizona, California** and **Nevada** — Bureau Reclamation, Denver, Colo., furnishing, del. water cooling and circulating equip. for refrigeration water sys. top Boulder Dam, Boulder Dam Project, Spec. 1533-D.

†**California** — Bureau Reclamation, Denver, Colo., furnishing, del. 2 gate frames and anchorages for gate frames for installation in diversion tunnel, Shasta Dam, Central Valley Project, Spec. 1534-D.

Bids Asked July 30

†**Arizona, California, Nevada**—Bureau Reclamation, Denver, Colo., furnishing, del. turbine inlet pipe for unit A-5 in Boulder Plant, Boulder Canyon Project, Spec. 1535-D.

†**California**—At Office Bureau Reclamation, Denver, Colo., furnishing, del. 2 gate frames for fixed wheel gates to be installed at Friant Dam, Central Valley Project, Spec. 1536-D.

Bids Asked July 31

†**North Carolina**—U. S. Eng., Wilmington, dredging 452,300 cu. yd. entrance channel in Silver Lake Harbor.

Bids Asked August 1

†**California** — Bureau Reclamation, Denver, Colo., furnishing, del. 4 gate frames for fixed wheel gates to be installed at Friant Dam, Central Valley Project, Spec. 1534-D.

Bids Asked about August 4

†**Minnesota**—U. S. Eng., St. Paul, channel imprv. on Minnesota River between Watson, Montevideo and Granite Falls.

Bids Asked August 11

†**Mass., Winchendon**—U. S. Eng., Providence, R. I., dike for protection filter beds in Birch Hill reservoir area, on east bank Millers River; adv. ENR 7/17.

†**O., Port Clinton**—U. S. Eng., 605 Federal Bldg., Detroit, Mich., removing, disposing 27,704 cu. yd., place measure, material other than ledge rock from Port Clinton Harbor; adv. ENR 7/17.

LOW BIDDERS

★†**Idaho, Boise**—Bureau Reclamation, Boise, July 7, Anderson Ranch Dam, near Mountain Home, from Morrison-Knudsen Co., 319 Bway., Boise, J. F. Shea Co., 617 S. Olive St., Los Angeles, Calif., F. J. Twaits Co., 816 W. 5 St., Los Angeles, Calif., Winston Bros., 411 W. 5 St., Los Angeles, Calif., **$9,986,203.** CD 6/17—ENR 6/19.

★†**Ky., Jamestown**—U. S. Eng., Nashville, Tenn., July 8, dam, appurtenant works, Wolf Creek, from S. A. Healy Constr. Co., 14 Fishers Lane, White Plains, **$15,803,890.** CD 6/24—ENR 6/26.

★†**Wash., Odair**—Bureau Reclamation, Customhouse, Denver, Colo., July 9, three 150,000 hp. electric generators for coulee Dam powerhouse, Spec. 967, from Westinghouse Electric & Mfg. Co., Union Bank Bldg., Pittsburgh, Pa., **$2,697,785.** CD 6/25—ENR 7/3.

Sask., Canora—Prairie Farm Rehabilitation Bd., McCallam Hill Bldg., Regina, dam, appurtenant works in Canora water storage project, from Traub Constr. Co. Ltd., 2034 Robinson St., Regina. **$15,000.**

CONTRACTS AWARDED

★†**Calif., Long Beach**—U. S. [illegible] 751 S. Figueroa St., Los Ang[illegible] dredging 4,480,000 cu. yd. material fr[illegible] mouth Los Angeles River, to Standard [illegible]ging Co., 325 Central Bldg., Los Angeles, [illegible]0,752. CD 6/26—ENR 7/3.

★†**Calif., San Francisco** — Y[illegible] & Docks, Navy Dpt., Wash., D. C., qu[illegible]all, Naval Dry Dock, Hunters Point, dre[illegible]ng, filling, riprapping, steel sheet piling, [illegible]rete work, etc., Spec. 10376, to Healey & T[illegible]tts Constr. Co., 1100 Evans Ave. **$673,000.** CD 6/[illegible] ENR 6/12.

†**Illinois**—U. S. Eng., 816 Co[illegible]house and Customhouse, St. Louis, Mo., re[illegible]ilding, etc., larging levees between Statio[illegible] 1140 and 1327 of the East Side Levee & S[illegible]itary Dist., Madison and St. Clair Counties, [illegible] Williams Crumpecker & Sons, Morehouse, [illegible] **$171,039.** CD 7/3—ENR 7/10, under LB.

†**N. J., Avon-by-the-Sea** — [illegible]ast Guard, Wash., D. C., timber bulkhead [illegible]tc., Shark River, to Thomas Proctor Co., 21[illegible] N. 5 Ave., Long Branch. **$16,000.**

N. J., Elk—Excavating, clearing out, grading banks various streams, **WPA. $35,000.** G. R. Swinton, 930 Atlantic A[illegible] Atlantic City, WPA and owner's engr.

†**N. J., Fort Hancock (Sandy Hook)**—War Dpt., 20 St. and Constitution Ave. N.W., Wash., D. C., stone bulkhead and soil stabilization, to Spiniello Constr. Co., 457 Riverside Ave., Newark. **$148,490.**

Pa., Galeton—Dpt. Forests & Waters, Harrisburg, dam on west branch of Pine Creek, at Cherry Springs, near here, day labor. **$58,000.**

★**Tex., Beeville**—Bee Co. (Beeville), DeWitt Co. (Cuero), Karnes Co. (Karnes City), San Patricio Co. (Sinton), and Wilson Co. (Floresville), ditching, drainage, embankments. **WPA. $786,506.**

Tex., Franklin—Robertson Co., c/o S. Roberts, judge, imprv. banks Brazos River adjacent to Wildcat Bridge, for erosion control. **WPA. $72,700.**

Tex., Hearne—Robertson and Milam Counties, river bank imprv., embankments, grading, ditching. **WPA. $72,686.**

Wash., Kennewick — Columbia Irrigation Dist., clearing, grubbing 25 acres, for sloping and ditch, backfilling. **WPA. $76,991.** CD 5/14—ENR 5/22.

Wash., Yelm—Yelm Irrigation Dist., flumes, main and lateral ditches, syphons and drop syphon boxes, etc. **WPA. $45,306.** CD 5/5—ENR 5/8.

Wyo., Miles City—Custer Co., M. E. Flinn, clk., irrigation facilities, **WPA. $34,362.**

N. S., Halifax (Dartmouth)—National Harbor Bd., Ottawa, Ont., jetty, Dartmouth Cove, to Atlantic Constr. Co., Ltd., Roy Bldg., Halifax, **$91,854.**

UNCLASSIFIED

PROPOSED WORK

★†**Ariz., Mesa**—APRONS, RUNWAYS—U. S. Eng., 751 S. Figueroa St., Los Angeles, Calif., aprons, runways, etc., for new airport. $1,878,061. Contract held up temporarily. CD 7/7—ENR 7/10, under CA.

Ark., Little Rock—SWIMMING POOL, etc. —C. E. Mayer, mayor, swimming pool and bathhouses for soldiers $125,000, athletic field $55,000.

Calif., San Bruno—CEMETERY IMPROVEMENTS—Con. Q.M., Fort Mason, San Francisco, rejected bids July 1, sprinkler sys., pumphouses at Wells 1 and 2, and booster station, Golden Gate National Cemetery. Will revise plans and readvertise. CD 6/2.

†**Calif., San Miguel**—FIELD HOUSES—War Dpt., 20 St. and Constitution Ave. N.W., Wash., D. C., field house, Camp Roberts, approx. $77,000.

★†**Calif., Victorville**—APRONS, etc.—U. S. Eng., 751 S. Figueroa St., Los Angeles, aprons, etc., airport. $1,317,245. Contract held up temporarily. CD 7/7—ENR 7/10, under CA.

†**Colo., Denver**—AIR FIELD FACILITIES—Con. Q.M., Lowry Field, additional facilities, Lowry Field. $343,600.

Conn., New Haven—BATHHOUSE—Park Dpt. Hall of Record, plans prepared by R. W. Foote, 157 Church St., bathhouse, 50x100 ft. administration building Lighthouse Point. $185,000.

†**Fla., Starke**—RECREATION FACILITIES —War Dpt., 20 St. and Constitution Ave. N.W., Wash., D. C., additional recreational facilities. $150,000.

†**Ga., Macon**—FIELD HOUSE—War Dpt., 20 St. and Constitution Ave. N.W., Wash., D. C., field house, Camp Wheeler. Approx. $77,000.

†**Ga., Wellston** — RESERVE AIRPLANE STORAGE AREA—War Dpt., 20 St. and Constitution Ave. N.W., Wash., D. C., reserve airplane storage area. $300,000.

Idaho, Coeur D'Alene—AIRPORT—Airport with runways 5,000 ft. long. Over $25,000.

Idaho, Gooding—AIRPORT—Surveys—airport, 4,000 ft. runways. Over $25,000

UNCLASSIFIED (Proposed Work, Cont'd.)

Indiana—RURAL LINES—Crawford Rural Electrification Corp., C. S. Dixon, agt., English, 65 or more additional lines Crawford and DuBois Counties. $150,000.

Kan., Independence — AIRPORT — G. H. Krienhagen, city clk., $100,000 bond election July 29, airport. $200,000.

†**Kan., Kansas City**—GASOLINE FUELING SYSTEM—U. S. Eng., 1201 Davidson Bldg., Kansas City, Mo., A. C. gasoline fueling svs. for Fairfax Airport. $25,000.

Kan., Newton—PARK and AIRPORT—E. D. Rafferty, city clk., defeated $60,000 bonds, park and airport imprvs. $100,000.

La., Albia—SWIMMING POOL—Municipal swimming pool. $30,000.

†**La., Leesville**—FIELD HOUSE—War Dpt., 20 St. and Constitution Ave. N.W., Wash., D. C., field house, Camp Polk. Approx. $77,000.

★**Michigan** — GAS PIPE LINE — Consumers Power Co., Jackson, to connect with Panhandle Eastern Pipe Line Co., to bring natural gas pipe line to 66 communities, incl. Jackson, Battle Creek, Flint, Pontiac, Saginaw, and Bay City, approx. 130 mi. $4,633,000.

★**Mississippi**—RURAL LINES—Rural Electrification Administration, E. Ford, chn., Taylorsville, new power lines in southern part of state, plans nearing completion steam generator plant, near Collins. $2,800,000. A. R. Lewis, Jackson, engr.

Miss., Meridian—TELEPHONE WIRES, etc. —Bell Telephone Co., Meridian, imprvs. maintenance operations Key Field, and in Meridian area, wires, poles, equip., etc. $150,000.

★†**Mo., Lebanon**—AIRPORT—U. S. Engrs., 1st and Douglas St., N. W., Wash., D. C., surveys airport, four 5,500 ft. rein.-con. runways, concrete aprons and ramp, hangars, barracks, drainage and water facilities, etc. $1,500,000.

★**Mo., Kansas City**—AIRPORT—Airport construction for Grand View Airport. $1,784,880. Contemplate WPA aid. CD 9/2—ENR 9/26.

Mo., Stanberry—PARK—State Park Bd., E. A. Mayes, asst. ch. of Parks, Jefferson City, state park, Gentry Co. $140,000.

Neb., Omaha—GAS LINE—Metropolitan Utilities Dist., 18 and Harney Sts., Omaha, high pressure gas line from plant to 30 and Davenport Sts. $117,000.

†**N. J., Clark** — GAS LINES, etc. — Federal Works Agency, 7 and D Sts. S.W., Wash., D. C., gas lines, telephone and electric sys. for defense housing. $57,033. J. H. Weitzen, Smith and Hobart Sts., Perth Amboy, owner's and WPA engr.

†**N. J., Clark** — LANDSCAPING — Federal Works Agency, 7 and D Sts. N.W., Wash., D. C., excavating, top soil stripped to 6 in. depth, landscaping area for housing. $138,600. WPA. J. H. Weitzen, Smith and Hobart Sts., Perth Amboy, WPA and owner's engr.

†**N. J., Dover**—ARSENAL IMPROVEMENTS —Navy Dpt., 18 St. and Constitution Ave. N. W., Wash., D. C., imprv. Lake Denmark Naval Arsenal, excavating, concrete wall, landscaping fence, etc. $74,282. WPA.

New York—RURAL LINES—Cooperative being formed c/o Kenneth Bullock, Federal Bldg., Jamestown, rural electric lines, Chautauqua Co. area, near Cherry Creek, $75,000-$100,000.

N. Y., Brooklyn — SUBSTATION — Robins Dry Dock & Repair Co., Erie Basin, plans by Albert Kahn & Associates, 345 New Center Bldg., Detroit, Mich., 2 story, 26x61 ft., electric substation. $25,000.

N. Y., Owego — SWIMMING POOL — Bd. Village Trustees, swimming pool. Over $25,000. W. Blintz, 116½ N. Washington St., Lansing, Mich., engr.

N. Y., Kanona and **Prattsburg**—TRACK REMOVAL—Kanona-Prattsburg R.R., B. Merritt, genl. mgr., Prattsburg, removing tracks on 12 mi. line between Kanona and Prattsburg. Over $25,000.

★†**N. Y., Rome**—AIRPLANE STORAGE AREA—War Dpt., 20 St. and Constitution Ave. N.W., Wash., D. C., reserve airplane storage area and depot supply Unit 2, $1,050,000.

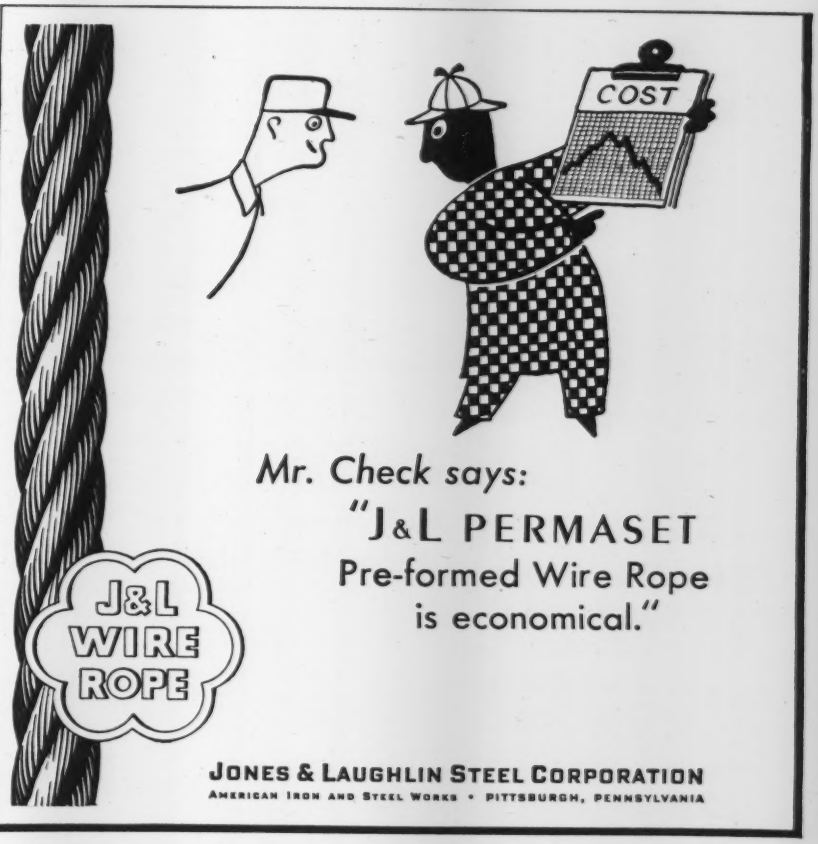
★†**North Carolina**—AIR BASE—Navy Dpt., 18 St. and Constitution Ave. N. W., Wash., D. C., Marine Corps Air Base, Cherry Point on south side Neuse River, 19 mi. from Morehead City. $14,990,000.

†**N. C., Wilmington**—GASOLINE STORAGE AND DISTRIBUTING SYSTEM—Con. Q.M., Camp Davis, rejected bids June 24, central gasoline storage and distr. sys. Will readvertise. CD 6/11—ENR 6/19.

North Dakota—RURAL LINES—Verendrye Electric Co-operative, transmission lines. $109,000.

Oklahoma—OIL PIPE LINE—Gulf Oil Co., Tulsa, surveys 15 mi. oil pipe line loop from Jenks eastward. $45,000.

Okla., Bethany—TRANSMISSION LINE—Oklahoma Gas & Electric Co., 321 N. Harvey St., Oklahoma City, 7 mi. 13,200 volt electric transmission line to serve Bluff Creek pumping station. $25,000. R. F. Danner, 136 N. E. 14 St., Oklahoma City, engr.



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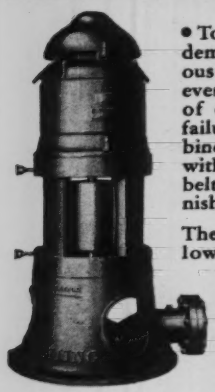

• To meet conditions demanding a continuous supply of water even during periods of electric current failure, Deming Turbine Pumps equipped with motor and flat belt drive can be furnished as illustrated.

The motor is the hollow shaft type; the vertical pulley of the crown faced type for quarter turn drive. Pulley is mounted on drive shaft. Impeller adjustment is made at motor top under canopy.

This and other secondary heads for Deming Deep Well Turbine Pumps are fully explained and illustrated in Bulletin No. 4700-8. Write for FREE copy.

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UNCLASSIFIED (Proposed Work, Cont'd.)

†Okla., Oklahoma City—RESERVE AIRPLANE STORAGE AREA—War Dpt., 20 St. and Constitution Ave. N.W., Wash., D. C., reserve airplane storage area. $300,000.

†Oregon-Washington — STEEL TOWER — Bonneville Power Administration, P. O. Box 337, Portland, Ore., bids soon, 230,000 volt steel tower crossing over Columbia River at Bradford Island. $140,000.

†Oregon-Washington—TRANSMISSION LINE —Bonneville Power Administration, P. O. Box 3537 Portland, Ore., transmission line from Rainier, Ore., to Longview, Wash., across Columbia River. $252,150.

Pennsylvania—OIL DEVELOPMENT—Williams Oil Co., Box 12, Bradford, development crude oil properties on Music Mountain, 10 mi. south of Bradford, drilling wells, connecting and gathering pipe lines, steel tank storage facilities, pumping plants, $50,000 or more.

Pa., Bethlehem — PARK — City Council, Pfeifle, mayor, developing 80 acre site into modern municipal park, incl. walks, roadways, grading, landscaping, recreation center units, swimming pool, tennis courts, etc. Over $40,000. R. L. Fox, 37 E. Broad St., city engr.

Pa., Erie—YARDS—Pennsylvania R. R. Co., W. D. Wiggins, ch. engr. Broad St. Station Bldg., 1617 Pennsylvania Blvd., Phila., imprvs., exten. yards and facilities along Lake Erie Shore. Over $25,000.

Pa., Kane—PARK—J. M. Paisley, boro secy., developing Glenwood Park, swimming pool, tennis courts, walks, roadways, ball diamonds, etc. $25,000. Boro Eng. Dpt., engrs.

Pa., Reading — RAILROADS — City and Pennsylvania R. R., W. D. Wiggins, ch. engr., 1617 Pennsylvania Blvd. Broad St., Station., Phila. and Reading Co., A. E. Owens, ch. engr., Reading Terminal, Phila., lowering tracks 2 railroads along Canal St., regrading street and repaving. $25,000. R. S. Chubb, city engr.

Texas—RURAL LINES—Erath Co. Electric Cooperative, G. A. Tunnell, Stephenville, bids soon 46 mi. rural electric lines, Hood Co. $30,000, Freese & Nichols, Capps Bldg., Fort Worth, engrs. CD 4/29—ENR 5/8.

★**Texas** and **Michigan** — PIPELINE — Panhandle Eastern Line Co., 4002 Commerce St., Dallas, Tex., 400 mi. steel mains in hook-up to supply natural gas to industrial districts primarily in Michigan, 200 mi. line to be laid in Michigan and 150 mi. of looping mains along owner's sys. from Texas field. $8,500,000.

Tex., Aransas Pass—RESORT and PIER—Ransom Island Development, c/o R. Kiek, pres., Aransas Pass, resort and pier development, Ransom Island, vicinity of here. Over $25,000. W. Forster, Nixon Bldg., Corpus Christi, and Alice, engrs.

Tex., Cuero—FLYING FIELD IMPROVEMENTS—Brayton Flying Service, Inc., c/o Brayton Field, additional expansion, imprvs., shop, utilities, hangar, etc., flying field. $100,000.

Tex., Fort Worth—RECREATION CENTER —Casa Manana Directors, c/o Will Mornning, 510 Houston St., recreation center, centennial grounds, swimming pool, bathhouse, etc. $200,000. P. M. Geren, 806½ Burnet St., archt. J. M. Pelich, 1103 Trinity Life Bldg., archt.

†Tex., San Antonio—AIRPLANE REPAIR DOCK—U. S. Eng., Santa Fe Bldg., Galveston, additional airplane dock. $290,000.

Tex., Vanderbilt — GAS PIPELINE — Magnolia Petroleum Co., Magnolia Petroleum Bldg., Dallas, 160 mi. 14 in., 30 mi. 16 in. gas pipeline out of West Ranch Pool, Jackson Co. $100,000.

Washington—POWER LINE—Benton Rural Electric Assn., Prosser, 100 mi. rural power line Horse Heaven and Rattlesnake Hills, in Paterson Dist. $65,000.

★**†Washington** — POWER LINES — Boneville Power Administration, P. O. Box 3537, Portland, Ore., two 115,000 v. power lines on single row of steel towers between North Bonneville and Vancouver. $1,602,700. Separate bids to be called for towers, conductors, and stringing.

★**†Wash., Bremerton** — REPAIR FACILITIES—Navy Dpt., 18 St. and Constitution Ave. N. W., Wash., D. C., repair facilities, Puget Sound Navy Yard, $3,000,000.

★**†Wash., Bremerton**—SHIPBUILDING FACILITIES—Navy Dpt., 18 St. and Constitution Ave. N. W., Wash., D. C., new shipbuilding facilities, at Puget Sound Navy Yard. $4,000,000.

Wash., Chehalis—AIRPORT—Surveys 1,000 ft. exten. runways, airport. Over $25,000. CD 11/20—ENR 12/5.

Wash., Ephrata — RUNWAYS — 1,000 ft. exten. airport runways. Over $25,000.

Wash., Spokane—RADIO TOWERS, etc.—Louis Wasmer, Inc., Radio Central Bldg., two 325 ft. towers for radio station and operations building. $200,000.

†Wash., Vancouver—LANDSCAPING — War Dpt., 20 St. and Constitution Ave. N.W., Wash., D. C., planting lawns, shrubbery, drainage, etc., at Barnes General Hospital, Vancouver Barracks. $33,000. WPA funds sought.

★**†Wash., Vancouver** — SUBSTATION — Bonneville Power Administration, P. O. Box 3537, Portland, Ore., substation addns. $2,094,370.

Wis., Milwaukee—TRACK FACILITIES—Harbor Comm., additional trackage facilities on Jones Island. $95,000. C. U. Stuhl, City Hall, ch. engr.

†Alaska, Kodiak—BOAT LANDING, etc.—Navy Dpt., 18 St. and Constitution Ave. N. W., Wash., D. C., small boat landing and boat shed for submarine base. $49,000.

†Alaska, Sitka — MOTOR TEST STAND—Navy Dpt., 18 St. and Constitution Ave. N.W., Wash., D. C., motor test stand, Naval Air Station. $50,000.

Alta., Big Lake—FLYING TRAINING SCHOOL—Dominion Govt., Ottawa, Ont., flying training school. $300,000 Dpt. Air Defense, Ottawa, Ont., archts. Dpt. Transport, Ottawa, Ont., engrs.

Alta., Fort St. John—AIRFIELD—Dominion Govt., Ottawa, Ont., enlarging airfield, incl. runways for heavy planes, radio beam. $100,000. Dpt. Transport, Ottawa, Ont., engr.

Alta., Red Deer—GAS SUPPLY—Lacombe Red Deer Gas Syndicate, Inc., Red Deer, gas supply. $70,000.

★**Alta., St. Albert**—AIRPORT—Dominion Govt., Ottawa, Ont., plans by Dpt. National Defense, Ottawa, Ont., airport. $600,000. Dpt. Transport, Ottawa, Ont., engrs.

BIDS ASKED

Bids Asked July 21

†Me., Cape Elizabeth — LIGHTHOUSE TOWER—U. S. Eng., Park Sq. Bldg., Boston, Mass., 12x16 ft. steel frame and armored construction lighthouse tower, 20 tons structural steel.

Bids Asked July 23

†Mich., Mt. Clemens—AIRFIELD BUILDINGS—U. S. Eng., 605 Federal Bldg., Detroit, brick, concrete administration building, nurses' quarters, warehouse, ordnance magazine (6 bays), 2 storehouses, gravel roads, post office, etc.

Bids Asked July 25

†Washington—SUBSTATION TRANSFORMERS—Bonneville Power Administration, P. O. Box 3537, Portland, Ore., furnishing 1 each potential transformers for substations at North Bonneville and Ampere.

Bids Asked July 29

New Jersey—TUNNEL APPROACH—Port of New York Auth., F. C. Ferguson, chm., 111 8 Ave., New York, N. Y., permanent paving New Jersey approach Lincoln Tunnel, Contr. MHT-80-A, Contr. MHT-80-B and Contr. MHT-80-C; adv. ENR 7/17.

Bids Asked July 31

Texas—RURAL LINES—Gilmer Electric Cooperative, Gilmer, 750 mi. rural electric lines, poles and transformers. $250,000. Freese & Nichols, Capps Bldg., Fort Worth, engrs.

†Tex., Galveston—FIRE CONTROL TOWERS—U. S. Eng., Galveston, 5 fire control towers on Bolivar Peninsula and Galveston Island, near here.

Tex., Gilmer—RURAL LINES—Rural Electric Administration, S. Scales, Gilmer, 250 mi. rural electric lines, Panola, Rockwall, Rains, Hopkins, Franklin, Hunt, Wood, VanZandt, Smith, Titus, Camp, Morris, Bowie, Upshur, Harrison, Rusk and Cherokee Counties. $325,000. Freese & Nichols, Capps Bldg., Fort Worth, engrs.

Bids Asked August 1

N. Y., Brooklyn — RECONSTRUCTING TRACKS—Bd. Transportation, 250 Hudson St., New York, reconstructing tracks and contact rail for part Rapid Transit Railroad, Route 49, Sect. 2.

Bids Asked

Tex., Vernon—AIR TRAINING SCHOOL—Ritchey Flying Service, Meacham Field, Fort Worth, and c/o CAA training school, Vernon, plans by R. P. Woltz, Jr., 810 Dan Waggoner Bldg., Fort Worth, air training school, two 2 story, 120x120 ft. barrack buildings, 30x90 ft. dispensary, 80x100 ft. mess hall, 30x120 ft. classrooms, 50x60 ft. headquarters buildings. $300,000. R. P. Woltz, Jr., 810 Dan Waggoner Bldg., Fort Worth, archt.

LOW BIDDERS

†Ia., Burlington—TRAILER PARK—Dpt. Agriculture, Farm Security Administration, Wash., D. C., July 7, trailer park, Iowa Ordnance Depot, part of defense project, from Modern Homes, Inc., St. Elmo, Ill., $29,845. CD 7/2.

†Ky., Fort Knox—RUNWAYS, etc.—Con. Q.M., concrete runways, concrete aprons, etc., at Godman Field, from Breslin Constr. Co., 1801 South Brook St., Louisville. $143,878. Bids 6/18. CD 6/4—ENR 6/12.

†Md., Carderock—STORAGE YARD — Navy Dpt., 18 St. and Constitution Ave. N.W., Wash., D. C., outside storage yard, U. S. Experimental Basin, from Helsing Co., Inc., Woodward Bldg., Wash., D. C. $99,850. Est. $100,000.

UNCLASSIFIED (Low Bidders, Cont'd.)

★**S. C., Charleston**—SHIPBUILDING PLANT—Charleston Shipbuilding & Drydock Co., 106 Concord St., preliminary work on shipbuilding plant, Concord St., from Charleston Constructors, Inc., Tradd St. and Adger's Wharf. **$145,652.** Total est. $1,000,000. Dotterer Eng. Co., 21 Broad St., Charleston, engr.

†**Washington** — TRANSMISSION SYSTEM CONDUCTOR—Bonneville Power Administration, P. O. Box 3537, Portland, Ore., July 7, furnishing 1, 620,000 ft. conductor and accessories, for Bonneville transmission sys., Inv. 2015, from Anaconda Wire & Cable Co., 25 Bway., New York, N. Y., and General Cable Co., 420 Lexington Ave., New York, N. Y., (identical bids) **$229,809.** CD 6/24—ENR 6/26.

†**Alaska**—LANDING FIELD AGGREGATE—U. S. Eng., 700 Central Bldg., Seattle, Wash., July 5, 21,000 cu. yd. sand for Annette Island landing field, from Alaska General Equipment Co., Ketchikan, **$56,700;** 32,000 cu. yd. coarse aggregate, from M. P. Munter, 1810 Bigelow Ave. N., Seattle, **$112,400.** CD 6/26—ENR 7/3.

CONTRACTS AWARDED

Calif., Alameda — RAILROAD TRACKS — Southern Pacific R.R. Co., W. H. Kirkbride, ch. engr., 65 Market St., San Francisco, removal railroad tracks, poles, various streets, to Ransome Co., 4030 Hollis St., Oakland. **$38,394.**

Calif., Lawndale—MAUSOLEUM—Congregation Temple, Sherith Israel, c/o Hyman & Appleton, archts., 68 Post St., San Francisco, rein.-con. mausoleum addn., to H. H. Larsen Co., 64 South Park St., San Francisco. **$175,000.** Est. $150,000. CD 6/25—ENR 7/3.

★†**Calif., Lemoore** — FLYING SCHOOL — U. S. Eng., 208 Postoffice Bldg., Sacramento, temporary buildings, water, gas, storm drain and electrical sys., sidewalks, water supply, Flying Field, Inv. 1105-41-296, to L. Franceschi Constr. Co., 465 Avila St., San Francisco. **$1,849,949.** Bids 6/28. CD 7/7—ENR 7/10.

★†**Calif., Merced**—FLYING SCHOOL—U. S. Eng., 208 Postoffice Bldg., Sacramento, temporary buildings, facilities, also water, gas, sewer, storm drains and electrical sys., Flying School, Inv. 1105-41-295, to W. W. Petley, 1426 South LaBrea Ave., Los Angeles, Calif. **$1,459,683.** Bids 6/28. CD 7/7—ENR 7/10, under Public Bldgs.

Calif., Petaluma — HATCHERY — Hardin Hatchery, Petaluma, 1 and 2 story, brick hatchery, to Vogensen Constr. Co., 100 Washington St. **$40,680.** J. L. Conrich, 188 Beaumont St., San Francisco, archt.

†**Colo., Denver**—RUNWAY PAVING—U. S. Eng., 1709 Jackson St., Omaha, Neb., additional paved runways, drainage sys., 135,000 sq. yd. concrete paving, 9,000 ft. pipe in trenches, for Lowry Field, to Peter Kiewit Sons Co., and J. B. Bertrand, Inc., 4295 York St., Denver. **$310,830.** Est. $289,730. Bids 6/28, awarded 6/30.

★†**Fla., Sebring**—FLYING SCHOOL—U. S. Eng., 1 and Douglas Sts. N.W., Wash., D. C., A.C. basic flying school, technical facilities, to Cleary Bros. Constr. Co., 823 Railroad Ave., West Palm Beach. **$3,627,640.** CD 6/24—ENR 7/3.

†**Ga., Fort Benning**—SPORTS ARENA—Con. Q.M., sports arena and ice plant, to Murphey Pound, Hill Bldg., Columbus. **$160,000.**

★†**Ga., Moultrie** — FLYING SCHOOL—War Dpt., 20 St. and Constitution Ave., N.W., Wash., D. C., advanced flying school, to Hardaway Contg. Co., 15-11 St., Columbus, **$2,010,000.** CD 6/5—ENR 6/9.

★†**Ga., Valdosta**—FLYING SCHOOL—U. S. Eng., 1 and Douglas Sts. N.W., Wash., D. C., advanced twin engine flying school, grading, paving runways, taxi strips, parking aprons, clearing, draining, etc., to Artley Co., 504 E. Bay St., Savannah, and Espy Paving & Constr. Co., 108 E. Bay St., Savannah. Est. **$4,820,500.** Reynolds, Stockman & Hills, Duval Bldg., Jacksonville, Fla., archts. and engrs. CD 6/17—ENR 6/19.

†**Ill., Glen View**—AIRFIELD BUILDINGS—U. S. Navy, 18 St. and Constitution Ave. N.W., Wash., D. C., paint dope and spray house at Curtiss Air Field, to Sherry-Richards Co., 201 N. LaSalle St., Chicago. Est. **$160,000.**

Ia., Vinton—SWIMMING POOL—Bd. Educ., Des Moines, swimming pool, State School for Blind, to Lippert Bros., Boone. **$33,292.** Bids 6/26. CD 6/12—ENR 6/19.

Me., Belfast—AIRPORT—U. S. Eng., 142 High St., Portland, Me., airport, to Herbert Sargent, Old Town. **$168,000.**

★†**Mass., Squantum** — AVIATION FACILITIES—Navy Dpt., 18 St. and Constitution Ave., N. W., Wash., D. C., aviation facilities, buildings, etc., Naval Air Corps, to Rugo Constr. Co., 80 Boylston St., Boston, **$627,200.** CD 6/25—ENR 6/27.

†**Mich., Battle Creek**—APRON and RUNWAY—Con. Q.M., Fort Custer, concrete apron and taxi runway at base of 109 Observation Squadron, Kellogg Airport, near Battle Creek and Fort Custer, to L. W. Edison Co., 924 Floral Dr. S.E., Grand Rapids. **$69,400.**

†**Mich., Battle Creek** — GASOLINE FUELING SYSTEM—War Dpt., 20 St. and Consti-

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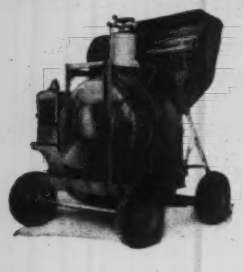

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UNCLASSIFIED (Contracts Awarded, Cont'd.)

tution Ave. N.W., Wash., D. C., gasoline fueling sys., Kellog Airport, to Aqua Sys., Inc., 385 Gerard Ave., New York, N. Y. **$30,612.**

†**Miss., Jackson** — GASOLINE FUELING SYSTEM—War Dpt., 20 St. and Constitution Ave. N.W., Wash., D. C., A. C. Gasoline fueling sys., Jackson Airport, to Aqua Systems, Inc., 385 Gerard Ave., New York, N. Y., **$100,599.**

†**Mo., Rolla** — FENCING, etc. — Con. Q.M., Fort Leonard Wood, 17,500 ft. protective fencing, ice plant, signal school barracks, ordnance buildings, etc., to Tulsa Rig, Reel & Mfg. Co., Philtower Bldg., Tulsa, Okla. **$216,-145.** Bids 6/28. CD 6/26.

Mo., St. Louis—GROUND IMPROVEMENTS—Bd. Educ., 911 Locust St., imprv. various school grounds through city, walks, grading, drainage facilities, landscaping, etc. **WPA. $190,000.**

†**N. J., Fort Monmouth**—TOP SOILING, etc.—War Dpt., 20 St. and Constitution Ave. N.W., Wash., D. C., top soiling, excavating, regrading, 4 in. seeding at new barracks and school areas. **WPA. $85,427.**

†**N. J., Metuchen**—STEAM DISTRIBUTING SYSTEM—War Dpt., Wash., D. C., steam distr. sys., Raritan Arsenal, to G. Stewart, 270 S. 20 St., Newark, **$124,900.** Bids 6/19, awarded 6/27.

†**N. J., Pedricktown**—ORDNANCE DEPOT IMPROVEMENTS—War Dpt., 20 St. and Constitution Ave. N.W., Wash., D. C., imprv. Delaware Ordnance Depot, incl. utilities, landscaping, etc. **WPA. $55,000.**

N. C., High Point—PARK—R. H. Sechrest, mayor, park and recreation center, **WPA. $53,562.** S. A. McBee, city engr.

N. C., Kinston—AIRPORT—R. H. Sechrest, mayor, airport. **WPA. $334,000.**

★†**O., Dayton** — LANDING FIELD — U. S. Eng., 1 and Douglas Sts. N.W., Wash., D. C., grading, draining, seeding, sodding, paving landing field area and excavation and grading Wright Field, to Price Bros., 1932 E. Monument Ave., Dayton, C. & G. Constr. Co., Dayton, and Hinton & Smalley, Celina. **$1,-692,055.**

†**Okla., Oklahoma City**—AIRPORT IMPROVEMENTS—U. S. Eng., Tulsa, grading, draining, fencing, airport, to El Reno Constr. Co., El Reno. **$254,000.**

★†**Okla., Oklahoma City**—AIR CORP DEPOT—U. S. Eng., Tulsa, Okla., air corp depot, permanent buildings, etc., to Chas. M. Dunning Constr. Co., 420½ N. Hudson St., Oklahoma City, Guy H. James Constr. Co., 3408 N. Harvey Parkway, Oklahoma City, and Patterson Steel Co., Tulsa. **$14,036,215.** CD 6/17—ENR 6/19.

Pa., Edinboro — GROUND DEVELOPMENT—General State Auth., 2 and Locust Sts., and Edinboro State Teachers College, Edinboro, imprv. college grounds, grading, placing top soil, walks, roadways, day labor. **$26,430.** CD 6/30—ENR 7/3.

Pa., Erie — SHIPBUILDING PLANT — Erie Concrete & Steel Supply Co., Inc., 1301 Cranberry St., 1 story, steel, concrete shipbuilding plant, foot Cascade St., Erie Harbor, own forces and separate contracts. Over **$40,000.** CD 7/1—ENR 7/10.

Pa., Johnstown—GAS MAIN — Pennsylvania Electric Co., W. C. Sontum, operating mgr., Johnstown, 6 in. gas main west side Strayer St., 4 in. main from Decker to Chandler Aves., own forces. **$25,000-$30,000.** CD 6/30—ENR 7/3.

S. C., Orangeburg—AIR PILOT TRAINING SCHOOL—Hawthorne Flying Service, Charleston, air pilot training school barracks, mess halls, recreation facilities, to Southeastern Constr. Co., 218 W. 2 St., Charlotte, N. C. **$150,000.** H. Tatum, 34 Broad St., Charleston, archt.

★†**S. C., Sumter**—AIRPORT and AIR SCHOOL—U. S. Eng., 1 and Douglas Sts. N.W., Wash., D. C., superstructure for airport and air school, to Dawson Eng. Co., Inc., 10 Gillon St., Charleston, and Boyle Constr. Co., Sumter, **$2,743,000.** Awarded 7/12. CD 6/17—ENR 6/19, under Public Bldgs.

†**Tex., Bonham**—AIR TRAINING SCHOOL IMPROVEMENTS—U. S. Eng., Fort Worth, shop and utilities in connection with Air Training School, to L. W. Wentzel, Sherman. **$47,922.** Bids 5/26. CD 5/19.

†**Tex., Brownwood**—ATHLETIC BUILDING, etc.—Con. Q.M., Camp Bowie, 2 story athletic and sports building and area, to J. E. Dickey, 216 Eleanor St., San Antonio, **$69,600.** Est. $77,000.

Tex., Henderson—AIRPORT—Rusk Co., c/o County Judge, Henderson, county-owned airport. **WPA. $320,000.**

†**Tex., Houston** — HANGARS — U. S. Eng., Santa Fe Bldg., Galveston, Tex., 2 steel hangars, to Claude Everett, Inc., 522 Barziza St. **$73,077.** Est. $54,818. Awarded 7/5.

Tex., Itaska—SUBSTATIONS—Brazos River Transmission Electric Co-operative, Inc., c/o E. D. H. Farrow, pres., Itasca, substations, dam for electric transmission project, Sect. 3, to Walco Engr. & Constr. Co., 2408 E. 4 Pl., Tulsa, Okla., **$209,838.** Total est. $1,500,000. Bids 7/7. CD 6/24—ENR 6/26, under Texas.

★†**Tex., Lubbock**—FLYING SCHOOL—U. S. Eng., Galveston, buildings, facilities, etc. for advanced Twin-Engine and [illegible] Flying School, to Holland Page, Georgetown Rd., Austin, Geo. Kies, Inc., 1700 [illegible] Austin, and L. H. Lacy, Austin, $1,675,000. Est. $5,000,000. CD 6/23—ENR 6/26.

Tex., Pottsboro—RAILWAY LINE—Missouri, Kansas & Texas R.R., F. Ringer, [illegible] engr., 13 St., St. Louis, Mo., 3½ mi. railway line between Pottsboro and A.C. training school site, to E. L. Martin, 4954 Cass Ave., Dallas. About **$68,000.**

Tex., San Antonio—BOWLING CENTER—Texas Bowling Center, Inc., c/o [illegible] Commercial St., 1 story, rein.-con. bowling center, rein.-con. fdn., incl. storage facilities, to G. W. Mitchell, c/o Builders Exch. Bldg. Approx. **$62,000.** Est. $75,000. H. P. Smith, c/o Natl. Bank Commerce Bldg., engr.

★†**Va., Yorktown**—PIER—Yards & Docks, Navy Dpt., Wash., D. C., construct pier, dredging, Naval Mine Depot, to Winc Contr. Co., 122 N. 8 St., Richmond, $1,274,000. CD 4/4—ENR 4/10.

†**Wash., Fort Lewis**—GASOLINE STORAGE and DISTRIBUTION SYSTEM—War Dpt., 20 St. and Constitution Ave. N.W., Wash., D. C., gasoline storage, distr. and dispensing sys. with concrete paving, at Grays Field, to Lord & Loryea, 4507 S. E. Milwaukee St., Portland, Ore., **$148,943.**

Wis., Cudahy—AIRPORT—Milwaukee Co., imprv. airport, grading, landscaping, paving, flood lighting, bridges for drainage. **WPA. $221,636.** W. F. Cavanaugh, Courthouse, engr.

Alta., Penhold—AIRPORT DEVELOPMENT—Dpt. Transport, Ottawa, Ont., airport development, drainage, electric cable ducts, etc., to Crown Paving & Constr. Co. Ltd., 11351-42 St., Edmonton, about **$37,000.**

Alta., Vermilion—PIPE LINE—Franco Pub. Serv. Ltd., Vermilion, 12 mi. gas pipe line from Vermilion to Shane gas well, day labor. **$60,000.** H. Davis, Liberty Bank Bldg., Buffalo, N. Y., consult. engr.

B. C., Bella Bella—AERODROME BUILDINGS—Dpt. National Defense for Air, Ottawa, Ont., additional buildings, to Coast Constr. Co. Ltd., 510 W., Hastings St., Vancouver, **$98,000.**

★**B. C., Fort St. John** — AIRPORT — Dpt. Transport, Ottawa, Ont., airport development, to Tomlinson Constr. Co. Ltd., 1 Somerset Bldg., Winnipeg, Man. About **$550,000.** CD 6/19.

B. C., Prince George—AERODROME—Secretary Dpt. Transport, Ottawa, Ont., preliminary work aerodrome, incl. clearing, grading, drainage, hard-surfaced runways and taxi strips, to Carter-Halls-Aldinger Co., Ltd., 670 Taylor St., Vancouver, about **$150,000.** Bids 6/9. CD 6/2—ENR 6/5.

B. C., Ucluelet—AIRPORT—Dpt. National Defense for Air, Ottawa, Ont., additional accommodation and services at airport, to Coast Constr. Co. Ltd., 510 W. Hastings Ave., Vancouver. **$110,000.**

Man., Dauphin — AERODROME — Dpt. Transport, Ottawa, Ont., developing aerodrome for Service Flying Training School, to Tomlinson Constr. Co. Ltd., 21 King St. E., Toronto, Ont. About **$304,000.**

Man., Portage La Prairie—FLYING TRAINING SCHOOL—Dominion Govt., Ottawa, Ont., additional wood buildings, Elementary Flying Training School and Air Observers School 7, to Claydon Co., Ltd., 253 St. Ames Rd., Winnipeg. About **$150,000.** CD 2/7.

N. B., Blissville—AIRPORT—Dpt. Transport, Ottawa, Ont., airport development, consisting clearing, stumping, grading, drainage, hard-surfaced runways, taxiways, to Canadian Constr. Co. Ltd., Royal Bank Bldg., Fredericton. About **$150,000.**

N. B., Moncton—RAILWAY YARDS—Canadian National Ry., Moncton, F. O. Condon, ch. engr. (Atlantic lines), exten. railway yards in connection with laying 10.5 mi. additional track, to Diamond Constr. Co. Ltd., Royal Bank Bldg., Fredericton. Total est. **$450,000.**

N. B., Scoudouc — AERODROME — Dpt. Transport, Ottawa, Ont., aerodrome development, clearing, grubbing, drainage, grading, etc. Repair Depot, to Dexter Constr. Co. Ltd., Fairville. About **$115,000.**

★**Ont., Burtch**—GROUND DEVELOPMENT—Dpt. National Defense for Air, Ottawa, Ont., ground development, Aerodrome, to G. W. Porter Constr. Co. Ltd., Harbour Comm. Bldg., Toronto. **$1,445,943.**

Ont., Kingston—AERODROME—Dpt. Transport, Ottawa, developing aerodrome for Commonwealth Air Training Plant, to McGinnis & O'Connor, Kingston. About **$39,000.**

Ont., Malton—FLYING FIELD—Dpt. National Defense for Air Ottawa additional construction E. F. T. School and Air Observers School, hangars, to Bennett & Pratt Ltd., 30 Bloor St. W., Toronto, about **$75,000.**

Ont., Oshawa—AERODROME—Dpt. Transport, Ottawa, aerodrome development, grading, hard surfaced runways, taxi strips, etc., for E. F. T. School, to Don Constr. Co. Ltd., 44 Victoria St., Toronto. About **$157,000.**

Ont., St. Catherines—AERODROME—Dpt. Transport, Ottawa, aerodrome, grading, drainage, hard surfaced runway and strips, to Ontario Constr. Co. Ltd., Bank of Toronto Bldg. About **$150,000.**

UNCLASSIFIED (Contracts Awarded, Cont'd.)

Ont., St. Eugene—GROUND WORK—Dpt. National Defense for Air, Ottawa, ground work, Elementary Flying Training School 13, to Bertrand & Frere, L'Original. **$123,229.**

Ont., Petawana—RIFLE RANGE—Dpt. National Defense, Ottawa, rifle range, Military Camp, to McLaughlin Bros., 120 Scott St., Ottawa. **$40,000.**

Ont., Welland—GROUND WORK—Dpt. National Defense for Air, Ottawa, ground work, Aerodrome, to Scott-Jackson Constr. Co. Ltd., 57 Bloor St. W., Toronto. **$128,389.**

P. E. I., Charlottetown—AIR NAVIGATION SCHOOL—Dpt. National Defense for Air, Ottawa, Ont., wood building for Air Navigation School, to M. F. Schuman Co. Ltd., Summerside. **$225,000.**

P. E. I., Summerside—GROUND WORK—Dpt. National Defense for Air, Ottawa, Ont., ground work, S. F. T. School 11, to Curran & Briggs Ltd., Manning Chambers, Toronto, Ont. **$89,830.**

Que., Longue Pointe — GRADING, etc. — Canadian Propellers, Ltd., 1010 Ste. Catherine St. W., Montreal, grading, drains, etc., plant site, to Verona Constr. Ltd., 7877 Drolet St., Montreal. **$60,000.** Engineer, c/o J. W. Ross, 1010 Ste. Catherine St. W., Montreal.

Que., Montreal—PARKING PLAZA, etc.—Canadian Natl. Rys., 360 McGill St., North Parking Plaza, platforms, baggage ramp, in connection with central passenger terminal, Dorchester St., to Charles Durcanceau, Ltd., 5847 Hamilton St. About **$150,000.**

Que., Riviere du Loup—COALING PLANT, etc.—Canadian National Rys., 360 McGill St., Montreal, H. A. Dixon, ch. engr. (oper.), 250 ton coaling plant and sand house, to W. W. Stewart, 1440 St. Catherine St. W., Montreal. **$28,000.** Bids 6/17. CD 6/10—ENR 6/12.

Que., St. Johns—AERODROME—Dpt. Transport, Ottawa, Ont., aerodrome development Rl. to St. Hubert and Air Observers School, to Dibblee Constr. Co. Ltd., 660 St. Catherine St. W., Montreal. About **$103,000.**

Sask., North Battleford—GROUND DEVELOPMENT — Dpt. National Defense for Air, Ottawa, Ont., ground development, Service Flying Training School, to McNamara Constr. Co. Ltd., 12 Industrial St., Toronto, Ont. **$36,998.**

Sask., Swift Current—GROUND WORK—Dpt. National Defense for Air, Ottawa, Ont., ground work, Service Flying Training School, to Dufferin Paving Co. Ltd., Fleet St. W., Toronto. **$40,789.**

LATIN AMERICA

Mexico—L. J. Fittin, Arena Mexico, Mexico City, plans sports auditorium for boxing, wrestling, etc., to be built in **Mexico City** by Louis James Fitten and Manolo Fernandez ***Vera Cruz City, Palacio Municipal, **Vera Cruz**, plans civil hospital, $165,000.

PUBLIC BUILDINGS

PROPOSED WORK

†**Ala., Childersburg**—Federal Works Agency, 7 and D Sts. S.W., Wash., D. C., fifty 1 story low cost dwelling units for civilian workers in ordnance plants.

★†**Ala., Huntsville**—War Dept., 20 St. and Constitution Ave., N.W., Wash., D. C., ordnance assembly plant, in connection with chemical warfare service arsenal. $6,000,000, with machinery and equip.

†**Ala., Maxwell Field** — War Dpt., 20 St. and Constitution Ave. N. W., Wash., D. C., post office, administration building, post exchange, recreation building, 2 schools, utilities, engineering. **$106,708.**

★**Ala., Montgomery**—Montgomery Housing Auth., C. P. Rogers, exec. dir., plans nearing completion 206 unit housing for colored. $750,000. CD 2/14—ENR 2/13.

★**Ala., Montgomery**—State, A. R. Forsyth, finance dir., 8 story, bsmnt. office building. $1,300,000. Warren, Knight & Davis, Protective Life Bldg., archts.

†**Ala., Sylacauga** — Federal Works Agency, 7 and D Sts. S.W., Wash., D. C., one hundred fifty 1 story low cost dwelling units for civilian workers in ordnance plants.

†**Ala., Talladega**—Federal Works Agency, 7 and D Sts. S.W., Wash., D. C., one hundred fifty 1 story low cost dwelling units for civilian workers in ordnance plants.

†**Ariz., Litchfield Park**—Federal Works Agency, Wash., D. C., 100 housing units.

Ark., Little Rock—C. E. Mayer, mayor, recreational center building. $225,000.

Ark., Little Rock—State Dpt. Educ., trade school, $300,000.

†**Calif., Bakersfield**—Bakersfield Housing Auth., 85 housing units for USHA.

★†**Calif., Los Angeles**—Phelps Dodge Copper Products Corp., 40 Wall St., New York, N. Y., constructing, equipping plant. $726,000. land and buildings and $2,269,000 for machinery and equip. Defense Plant Corp. will finance.

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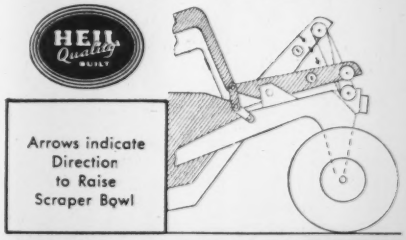

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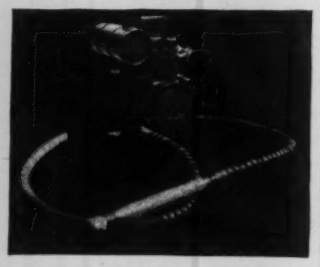

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PUBLIC BLDGS. (Proposed Work, Cont'd.)

Calif., North Sacramento (br. Sacramento)—North Sacramento School Dist., plans by G. C. Sellon, Calif. State Life Bldg., Sacramento, wood frame, concrete school with auditorium, shop unit and cafeteria building. $160,000. CD 6/18—ENR 6/26.

†**Calif., Richmond** — Richmond Housing Auth., Richmond, 450 unit housing for USHA.

Calif., San Francisco—City and County of San Francisco, rein.-con. gymnasium at Lowell High School. $150,000. Bureau of Architecture, City Hall, archts.

Calif., San Francisco—City and County of San Francisco, additional units for West Portal and Denman Schools. $150,000 or more. Municipal Bureau of Architecture, City Hall, archts.

†**Colo., Denver**—U. S. Eng., 1709 Jackson St., Omaha, Neb., rejected bids June 26, 5 storehouses. Will readvertise. CD 6/20.

†**Colo., Fort Logan**—U. S. Eng., 1709 Jackson St., Omaha, Neb., additional buildings. $72,755.

†**Conn., Bristol** — Federal Works Agency, Wash., D. C., 200 unit housing.

Conn., East Hartford (br. Hartford)—Town, Supt. Schools, Chapman St., brick, steel school, for Silver Lane Dist. $150,000.

★†**Conn., Naugatuck**—U. S. Rubber Co., Naugatuck, synthetic rubber plant. $1,250,000. Fletcher-Thompson, Inc., 1336 Fairfield Ave., engrs. Defense Plant Corp. will finance. CD 7/3—ENR 7/10.

Del., Newark—University of Delaware, plans by Martin & Jeffers, du Pont Bldg., field house. Over $150,000.

★**Del., Wilmington** — Wilmington Housing Auth., plans by G. M. Whiteside, DuPont Bldg., housing. $1,000,000. CD 2/7—ENR 2/13.

†**D. C., Wash.**—District of Columbia Housing Auth., 650 unit housing for USHA.

†**D. C., Wash.**—Alley Dwelling Housing Auth., 350 unit housing.

†**Fla., Banana River**—Navy Dpt., 18 St. and Constitution Ave. N.W., Wash., D. C., 50 unit housing.

†**Fla., Jacksonville**—Navy Dpt. 18 St. and Constitution Ave. N.W., Wash., D. C. 400 unit housing.

†**Fla., Pensacola** — U. S. Housing Auth., Wash., D. C., 100 family units for families enlisted and civilian employees of Naval Air Station, on 20 acre site just outside city limits near Moreno Court. $260,000 plus.

†**Fla., Pensacola** — U. S. Housing Auth., Wash., D. C., 100 family unit homes for families army enlisted men, Ellyson Field, near here. $260,000 plus.

†**Ga., Savannah**—Savannah Housing Auth., 150 unit housing for USHA.

★**Ill., Chicago**—Illinois Armory Bd., 208 S. LaSalle St., armory, $3,000,000.

Ill., Decatur—Bd. Educ., W. Harris, supt., bond election in August, school. $150,000. Harris & Spangler, D-catur, archts.

†**Ill., Great Lakes**—War Dpt., 20 St. and Constitution Ave. N.W., Wash., D. C., bids latter part July administration building addn. $260,000. CD 1/21—ENR 1/23.

Ill., Joliet—Bd. Educ., G. N. Hufford, supt., school. $300,000.

†**Ill., Lake Crab Orchard**—War Dpt., Wash., D. C., munitions and bag loading plant.

Ill., Sterling—Bd. Educ., E. T. Janssen, pres., approved $350,000 bonds for school.

†**Ind., Connersville**—Public Bldgs. Administration, Wash., D. C., 300 unit housing.

†**Ind., Fort Wayne** — Fort Wayne Housing Auth., 75 unit housing, for USHA.

†**Ind., Kingsbury-LaPorte** — Federal Works Agency, Wash., D. C., 400 housing units.

†**Ind., Madison**—Pub. Bldgs. Administration, Wash., D. C., 100 unit housing.

†**Ia., Burlington**—Pub. Bldgs. Administration, Wash., D. C., 200 unit housing.

★**Ia., Burlington** — Bd. Educ., R. H. Bracewell, supt., junior high and grade school buildings. Over $800,000.

★**Ia., Des Moines**—State, Des Moines, bids in spring, office building. $1,500,000. CD 6/11—ENR 6/19.

Ia., Durant—L. Schneeklath, city clk., approved $115,000 bond issue municipal light plant.

★**Ia., Sioux City**—C. A. Norrbom, city clk., bids early in September, auditorium. $700,000. K. E. Westerlin, 738 Badgerow St., Sioux City, archt. CD 7/2—ENR 7/10.

†**Kan., Wichita** — Federal Works Agency, Wash., D. C., 600 unit housing.

★†**Ky., Fort Knox**—War Dpt., 20 St. and Constitution Ave. N.W., Wash., D. C., bids soon, 110 barracks, 31 mess halls, 36 administration buildings, 10 recreation buildings, 3 infirmaries, 3 post exchanges, 3 guard houses, classrooms, headquarters building, 7 warehouses, fire station, motor repair shop, theatre, utilities, telephone sys. $3,628,100. CD 7/8—ENR 7/10.

†**La., New Orleans**—New Orleans Housing Auth., 325 unit housing for USHA.

★†**La., New Orleans**—Pub. Buildings Administration, Wash., D. C., 325 family dwelling units for industrial workers and enlisted personnel, 1 and 2 story buildings, utilities, ground development, $800,000.

†**Md., Baltimore**—Baltimore Housing Auth., 1,000 unit housing, for USHA.

†**Md., Suitland**—Pub. Bldgs. Administration, Wash., D. C., rejected bids June 17, Federal Office Building 3. CD 6/27—ENR 7/3, under LB.

Mass., Brookline (br. Boston)—Comrs. Norfolk Co., County Court House, High St., Dedham, plans by Coolidge, Shepley, Bulfinch & Abbott, 1 Court St., Boston, brick, steel, granite court house. $270,000.

†**Mass., Springfield** — Springfield Housing Auth., 300 unit housing, for USHA.

★†**Mich., Lansing**—Nash-Kelvinator Corp., 14250 Plymouth St., Detroit, construction equipping plant for manufacture aircraft parts, $1,704,392 for land and buildings, $13,446,352 for equip. machinery. Defense Plant Corp. will finance.

†**Miss., Biloxi**—Biloxi Housing Auth., 175 unit housing, for USHA.

†**Miss., Meridian**—Public Bldgs. Administration, Wash., D. C., 100 unit housing.

Mo., Brookfield—G. Carpenter, city clk., 2 story, bsmnt., 68x139 ft., brick, concrete building. $150,000. Deering & Clark, Haden Bldg., Columbia, archts.

Neb., Omaha—Bd. Educ. plans by John Latenser & Sons, 1307 Farnam St., 4 story South High School addn. $400,000.

†**N. J., Cape May**—Navy Dpt., 18 St. and Constitution Ave. N.W., Wash., D. C., 50 unit housing.

★†**N. J., Dover**—War Dpt., 20 St. and Constitution Ave. N.W., Wash., D. C., various buildings, utilities, Picatinny Arsenal. $530,000.

†**N. J., Fort Dix**—War Dpt., 20 St. and Constitution Ave. N. W., Wash., D. C., post exchange offices and storehouse.

†**N. J., Fort Monmouth**—War Dpt., 20 St. and Constitution Ave. N.W., Wash., D. C., post exchange office and warehouse.

N. Y., Mamaroneck—Completing plans, Central School addn. $150,000. A. H. Knappe & Associates, 192 Lexington Ave., New York, archts. Town voted on project CD 6/20—ENR 6/26.

N. Y., New York—Dpt. Hospitals, 125 Worth St., altering 3 story hospital and service kitchen building, Welfare Island, opposite 52 St. $200,000.

†**N. C., Charlotte**—Federal Works Agency, 7 and D Sts. S.W., Wash., D. C., housing units, 75 for non-commissioned officers, Air Base, and 10 units for civilians. $237,500.

†**N. C., Jacksonville**—Federal Works Agency, 7 and D Sts. S.W., Wash., D. C., 700 housing units, Marine Base.

†**N. C., Jacksonville**—Navy Dpt., 18 St. and Constitution Ave. N.W., Wash., D. C., 700 unit housing.

†**O., Canton**—Pub. Bldgs. Administration, Wash., D. C., 300 unit housing.

†**O., Chillicothe**—War Dpt., 20 St. and Constitution Ave. N.W., Wash., D. C., group buildings for Army induction camp. Mills, Rhems, Bellman & Nordoff, 518 Jefferson Ave., Toledo, archts.

†**O., Cleveland**—Cleveland Housing Auth., Cleveland, 500 unit housing for USHA.

†**O., Cleveland**—National Advisory Com. of Aeronautics, E. R. Sharp, constr. administrator, Langley Field, Hampton, Va., 50x100 ft. fuels and lubrication building, each end section 50x100 ft., Cleveland Airport. $250,000.

†**O., Port Clinton**—Federal Works Agency, Wash., D. C., 100 unit housing.

★†**Okla., Fort Sill**—Con. Q.M., Fort Sill, 20 additional barracks, 5 mess halls. $750,000 appropriated.

†**Ore., Portland**—U. S. Eng., 628 Pittock Blk., blids soon motor repair shop and oil house, Portland Air Base at Portland-Columbia Airport, $40,000.

Pa., Aliquippa—Bd. Educ., L. M. Wilson, supt., 1006 Irwin St., bids in fall, 2 story, bsmnt., brick, steel auditorium building, high school grounds. $250,000. Carlisle & Sharrer, 507 Martin Bldg. N.S., Pittsburgh, archts. CD 3/13—ENR 3/20.

Pa., Altoona—Altoona Hospital, R. L. Gill, supt., 2803 4 Ave., sketches by Hunter & Caldwell, 3601 Fifth Ave., brick, steel, tile hospital addn. $150,000.

Pa., Beaver—Bd. Comrs. Beaver Co., R. H. Bennett, co. controller, Courthouse, bids soon, 2 story, bsmnt., brick, steel, stone power house, site of present tuberculosis sanitarium. $50,000. Carlisle & Sharrer, 507 Martin Bldg., Pittsburgh, archts.

★†**Pa., Duquesne** — Defense Plant Corp., Wash., D. C., 1 story, steel mill extension $10,000,000. Carnegie-Illinois Steel Corp., Carnegie Bldg., Pittsburgh, Pa., will operate. M. W. Reed, Carnegie Bldg., Pittsburgh, engr.

Pa., Haverford—School Bd., Haverford Twp., bids soon school addn. $175,000. Davis & Dunlap, Sansom St., Phila., archts. CD 4/2—ENR 4/17.

PUBLIC BLDGS. (Proposed Work, Cont'd.)

★†Pa., **Homestead** — Defense Plant Corp., Wash., D. C., 1 story, steel mill buildings. $75,000,000. Carnegie-Illinois Steel Corp., Carnegie Bldg., Pittsburgh, will operate. W. M. Reed, Carnegie Bldg., Pittsburgh, engr.

★†Pa., **Pittsburgh**—Allegheny Co. Housing Auth., 1305 Law & Finance Bldg., bids soon, general contract Glen Hazel Heights Defense Housing, 1,000 families, for FWA. Total est. $4,500,000. Grading awarded to Ralph Meyers, Salem, Ind.***draining, cribbing and stone walls, to D. D. Mullett, 224 9 St., Aspinwall***water sewer and gas mains, to Mike Manella, Grant Bldg. CD 7/2—ENR 7/10.

†Tenn., **Alcoa**—Federal Works Agency, Wash., D. C., 250 unit housing.

Tex., Del Rio—Del Rio Housing Auth., V. D. Curry, exec. dir., rejected bids July 1, San Jose housing, 31 buildings, 126 units. Phelps, DeWees & Simmons, Majestic Bldg., San Antonio, archts. F. T. Drought, Frost Bank Bldg., San Antonio, engrs. CD 6/30.

†**Tex., Hitchcock**—Con. Q.M., Camp Wallace, cancelled bids to have been opened June 25, 3 chapels, 1 recreation building, officers' mess buildings. CD 5/9 and 6/17—ENR 5/15 and 6/19.

★†**Tex., Hitchcock**—Federal Works Agency, 7 and D Sts. S.W., Wash., D. C., high school, facilities. $644,000.

★†**Tex., Houston**—Federal Works Agency, 7 and D St. S. W., Wash., D. C., school buildings in Independent School Dist. $1,140,000.

Tex., Lolita—Bd. Educ., school imprv. $155,000. Bonds voted.

†**Tex., Lufkin**—Civilian Conservation Corps, Commerce Bldg., Wash., D. C., and City of Lufkin, mechanical and repair shop facilities and personnel housing quarters, in central repair zone shop area. $80,000.

†**Tex., Mineral Wells** — Federal Works Agency, 7 and D St., S.W., Wash., D. C., 16 demountable houses for families and negro soldiers, 84 demountable houses for enlisted white men and civilians. $300,000. C. O. Chromaster, 401 Century Bldg., Fort Worth, archt. J. Durgess, Mineral Wells, engr. CD 6/16—ENR 6/26.

Tex., Mineral Wells—Bd. Educ., plans by P. M. Gere, 806½ Burnet St., Fort Worth, 2 story high school. $250,000.

†**Tex., Palacios**—Con. Q.M., Camp Hulen, cancelled bids to have been opened July 12, motor repair shop, storage house, wash rack, inspection rack. $77,000. CD 7/7.

†**Tex., Pasadena**—Federal Works Agency, 7 and D Sts. S.W., Wash., D. C., 1 or 2 public school buildings for defense workers. $337,400.

Tex., San Angelo—San Angelo Junior College, c/o W. H. Elkins, three 3 story bsmnt. buildings, brick, stone gymnasium. $283,000. W. C. Hendrick Co., 1st Natl. Bank Bldg., Fort Worth, archt.

†**Tex., Victoria**—Federal Works Agency, 7 & D St., S.W., Wash., D. C., housing, incl. 1 and 2 story frame buildings, ground development, utilities, etc., Projects 1, 2 and 3, for Army personnel attached to Air Corps Training School Project. Total $450,000.

★†**Tex., Wichita Falls** — Federal Works Agency, 7 & D Sts., Wash., D. C., 1 and 2 story frame buildings, etc., housing, to provide living facilities for enlisted personnel, Air Corps Training School (mechanical) now under construction. $650,000.

†**Tex., Wichita Falls**—Pub. Bldgs. Administration, Wash., D. C., 175 unit housing.

★†**Va., Camp Lee**—War Dpt., 20 St. and Constitution Ave. N.W., Wash., D. C., 2 office buildings, 2 storehouses, 11 class rooms, post exchange, barracks, officers quarters, mess halls, service club, infirmary, hospital ward, telephone sys., utilities. $690,500.

†**Va., Dahlgren**—Navy Dpt., 18 St. and Constitution Ave. N.W., Wash., D. C., 50 unit housing.

†**Wash., Seattle**—Seattle Housing Auth., 500 unit housing for USHA.

★**Wash., Seattle** — Seattle Housing Auth., Central Bldg., bids early in August, 500 low cost housing units, Empire Way and Cheasty Blvd. $1,500,000. B. M. Priteca & A. M. Young, Palomar Mldg., archts. D. Griffin, Lloyd Bldg., engr. CD 6/4—ENR 6/12.

★**Wash., Tacoma**—Tacoma Housing Auth., H. W. Andrews, chn., City Hall, will not construct housing. Project abandoned. $1,000,000. USHA. CD 4/30—ENR 5/8.

†**W. Va., Charleston**—Charleston Housing Auth., 400 unit housing for USHA.

Wis., Whitehall—H. J. Elstad, town clk., installing diesel generating equip. in municipal power plant. Mead, Ward & Hunt, State Journal Bldg., Madison, engrs.

†**Alaska, Sitka**—Navy Dpt., 18 St. and Constitution Ave. N.W., Wash., D. C., station maintenance building, Naval Air Station. $45,500.

Alta., Edmonton—University Hospital Bd., Edmonton, Soldiers wing addn. $150,000.

N. S., Amherst—Abbatoir. $40,000.

N. S., Truro—Dominion Govt., Ottawa, Ont., plans by Dpt. National Defense, Ottawa, Ont., machine shop, carpenter shop and general mechanical repair shop, Military Camp, Debert, near here. $50,000.

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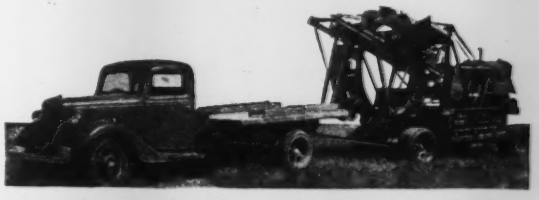

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PUBLIC BLDGS. (Continued)

BIDS ASKED

Bids Asked July 17

N. Y., Syracuse—Adjutant General, Div. Military & Naval Affairs, Capitol, Albany, field artillery armory. $275,000. Extended date. CD 6/17—ENR 6/19.

Bids Asked July 22

★†**Conn., Stratford**—Federal Works Agency, 2082 Kings Highway, Fairfield, 400 unit National Defense Housing, Stonybrook Rd. $1,400,000. B. S. Gruzen, 921 Bergen Ave., Jersey City, N. J., archt. CD 6/11—ENR 6/19.

Mich., Kalamazoo—State Bd. Educ., Teachers College, Kalamazoo, 2 story, bsmnt., brick, steel, stone, concrete dramatic arts building. $150,000. Malcolmson, Calder & Hammond, 1217 Griswold St., Detroit, archts.

†**Mich., Mount Clemens**—U. S. Eng., 605 Federal Bldg., Detroit, Mich., brick, frame regimental chapel.

N. J., Caldwell—Essex Co., Hall of Records Bldg., Newark, addns., rebuilding, enlarging existing power plant, County Penitentiary. $40,000. Epple & Kahrs, 15 Washington St., Newark, engr.

Bids Asked July 23

†**Conn., Windsor Locks**—Federal Work Agency, 2082 Kings Highway, Fairfield, 85 unit defense housing. $300,000. Hugh Stubbins, Jr., 46 Cornhill, Boston, archt. CD 6/18—ENR 6/26.

†**Fla., Jacksonville**—Yards & Docks, Navy Dpt., Wash., D. C., 14 officers' quarters. Bids June 14 rejected. CD 6/3—ENR 6/5.

Bids Asked July 25

★†**Conn., East Hartford**—Federal Works Agency, 2082 Kings Highway, Fairfield, 500 dwelling units, Laurel Park Heights. $1,500,000. Scheide Brown & Wilkins, 100 Pearl St., Hartford, Sherwood F. Jeter, Jr., 594 Prospect St., Hartford, and Lyons & Mather, 211 State St., Bridgeport, archts. CD 6/17—ENR 6/19.

†**Conn., Fairfield**—Federal Works Agency, 2082 Kings Highway East, constructing Defense Housing Project, Conn. 6072-X. J. L. Burley, 51 E. 42 St., New York, archt.; adv. —ENR 7/17.

Conn., Windsor Locks — Federal Works Agency, 2082 Kings Highway, defense housing, Conn. 6081-X. Hugh Stubbins, Jr., 46 Cornhill, Boston, Mass., archt. Extended date; adv. ENR 7/17. CD 7/9—ENR 7/17.

Nev., Winnemucca—Humboldt Co. High School Dist. rein.-con. gymnasium, Humboldt Co. High School. $165,000 or more.

N. Y., Green Haven — Comr. Correction, State Office Bldg., Albany, connecting corridors, Green Haven Prison; adv. ENR 7/17.

†**N. Y., Niagara Falls**—Pub. Bldgs. Administration, Wash., D. C., 300 housing units for industrial workers.

Bids Asked July 26

★†**Conn., Bridgeport**—Federal Works Agency, 2082 Kings Highway, Fairfield, 250 frame homes for National Defense Housing, Huntington Turnpike. $750,000. W. J. Skinner, 120 Bank St., archt. CD 6/11—ENR 6/19.

★†**Conn., Bridgeport**—Federal Works Agency, 2082 Kings Highway, Fairfield, 400 dwelling units, National Defense Housing, Success Park. $1,000,000. H. G. Lindsay, 211 State St., archt. CD 5/20—ENR 5/22.

Bids Asked July 28

Conn., Greenwich — Town, Julian Curtis School. Over $258,000.

★**Conn., Greenwich** — J. G. Tobin, supt. Schools, brick, steel, stone, blue stone, Vermont marble Central School, Millbank Ave. $600,000. W. B. Tubby, 444 Madison Ave., New York, N. Y., Coffin & Coffin, 125 E. 46 St., New York, N. Y., P. N. Sunderland, 20 West St., Danbury, Conn., archts. C. W. Hubbard, 115 Greenwich Ave., Greenwich, engr. CD 1/10—ENR 1/16.

Bids Asked July 29

†**Conn., Bantam**—Federal Works Agency, Defense Housing Div., 2082 Kings Highway, Fairfield, 40 unit, National Defense Housing. $120,000. D. C. Sanford, Jr., Eden St., Stamford, archt. CD 6/25—ENR 7/3.

†**Conn., Bridgeport**—Federal Works Agency, 2082 Kings Highway, Fairfield, 150 dwelling units, National Defense Housing, Park Ave. and Benson St. $450,000. Charles Wellington Walker, 1115 Main St., archt. CD 6/25—ENR 7/3.

Ill., East St. Louis—St. Clair Co. Housing Auth., E. P. Griffin, chn., L. E. Davenport, dir., Spivey Bldg., Samuel Gompers Homes Housing, 111, 1-1, and John Robinson Homes, 111, 1-2 $2,140,000. USHA. Associated Architects of East St. Louis, Spivey Bldg., archts. J. D. Falvey, 316 N. 8 St., St. Louis, Mo. structural engr. R' Toensfeldt, Security Bldg., St. Louis, Mo., electrical engr. CD 5/23—ENR 5/29.

Ky., Eddyville — Commonwealth of Kentucky, installing power generating equip., fuel storage tanks, etc., Eddyville State Prison. R. C. Wyatt, Frankfort, ch. engr.

Bids Asked July 30

★†**Conn., New Britain**—Federal Works Agency, 2082 Kings Highway, Fairfield, 200 unit National Defense Housing, Ellis St. and Rocky Hill Ave. $700,000. H. F. Ludorf, 410 Asylum St., Hartford, archt. CD 6/19—ENR 6/26.

†**South Carolina** — Pub. Works Officer, Charleston, officers' quarters, etc., Charleston Navy Yard and Parris Island Marine Base. Extended date. Douglas Elliman, 5 Exchange St., Charleston, archt. CD 7/9.

Bids Asked July 31

S. D., Vermillion—University of South Dakota, administration building $200,000. Perkins & McWayne, 320 Paulton Blk., Sioux Falls, archts. CD 4/16—ENR 4/24.

Bids Asked August 5

★**Calif., Los Angeles**—Housing Auth. of city of Los Angeles, 1031 S. Bway., Rancho San Pedro low-rent housing, San Pedro. $1,302,000. Architects Collaborating, 1006 Architects Bldg., Los Angeles, archt. [illegible] N. Rapp, 1014 Edison Bldg., structural engr. CD 7/1—ENR 7/10.

Va., Richmond—Richmond Housing Auth., W. S. Meacham, chn., Gilpin Court Housing, Project VA 7-1. Carneal, Johnston & Wright, Atlantic Life Bldg., archts. and engrs.; adv. ENR 7/17. CD 6/30—ENR 7/3.

Bids Asked August 7

★**Ark., Little Rock** — Little Rock Housing Auth., 911 Wallace Bldg., 250 unit low cost housing. $1,000,000. CD 4/1—ENR 4/3.

Bids Asked August 12

Ia., Muscatine — Municipal Bd. Water & Light, H. Zeug, secy., power plant imprvs., Sects. 3 to 9 (inclusive). Stanley Eng. Co., Muscatine, engr.

Bids Asked August 26

★**Calif., Los Angeles** — Los Angeles City Housing Auth., 1250 Western Pacific Bldg., 165 unit housing project, Avalon Blvd. and 88 Pl. $643,000. Tentative date. California Housing Architects, 400 Rowan Bldg., archts. P. Jeffers, 816 W. 5 St., engr. CD 5/7—ENR 5/15.

Bids Asked about September 1

Pa., Grove City—Boro, additions, extens., imprvs., municipal power and light plant. Over $50,000. Chester Engineers, 210 E. Park Way, Pittsburgh, engr. CD 6/4—ENR 6/12.

Bids Asked

†**Md., Annapolis**—U. S. Naval Academy, Com. C. J. Johnson, in charge, altering Library Bldg., Job 10492.

Ont., Windsor—D. J. Cameron, archt., Bartlett Bldg., hydro-electric substation, Seminole St. for Public Utilities Comn., Canada Bldg. $63,579.

LOW BIDDERS

Calif., Los Angeles—Los Angeles Bureau Power & Light, 205 S. Bway., July 8, 3 buildings, warehouse, tool house, locker rooms, truck shed, at Dist. Headquarters 1, from Frank H. Strohecker, 1738 W. 49 St. $78,790. CD 6/24—ENR 6/6.

†**Ill., Savanna**—War Dpt., 20 St. and Constitution Ave. N.W., Wash., D. C., imprv. power plant, Savanna Ordnance Depot, from Chicago Pneumatic Tool Co., 6 E. 44 St., New York, N. Y. **$84,946.**

†**Miss., Hattiesburg**—Con. Q.M., Camp Shelby, 26 day rooms, from Southern Mfg. Co., Tuscaloosa, Ala. **$187,000.** Est. $195,000. Bids 6/20, awarded 6/28. CD 5/9—ENR 5/15.

†**N. J., Fort Dix**—Con. Q.M., 3 theatres, 2 storehouses, service club, officers quarters, recreation building, guest house, utilities, from O'Driscoll & Grove, Inc., 247 Park Ave., New York, N. Y. **$251,000.** CD 6/17—ENR 6/19.

★**N. J., Jersey City**—Jersey City Housing Auth., City Hall, July 10, Booker T. Washington Housing, Freemont Ave., Bright and Colden Sts., from Auf Der Heide & Aragona, 530 Jackson St., West New York. **$748,200.** CD 6/25—ENR 7/3.

†**N. C., Fort Bragg**—Con. Q.M., June 28, standard ordnance shop and boiler house, from T. A. Loving & Co., Bank of Wayne Bldg., Goldsboro. **$79,200.** Bids 6/28.

N. C., Wilmington — Wilmington Housing Auth., clearing, excavating, grading, site imprv., sanitary sewers, etc., from A. H. Guion & Co., Kinney Bldg., Charlotte. **$250,989.** Lynch & Foard, Wilmington, archts. W. H. Deitrick, 115 W. Morgan St., Raleigh, archts.

Pa., Lower Merion (Phila. P. O.)—Lower Merion School Bd., vocational school from R. S. Herzog, 1505 Race St., Phila., **$237,000.** CD 2/3—ENR 2/6.

S. C., Spartanburg—Spartanburg Co., June 23, general hospital addn., from P. S. West Constr. Co., Statesville, N. C. **$266,000.** CD 6/18.

CONTRACTS AWARDED

★†**Ala., Dothan**—U. S. Eng., 1 and Douglas Sts., N.W., Wash., D. C., training school, to Southeastern Constr. Co. and Henderson, Black & Green, Troy, **$3,100,000.** CD 6/17—ENR 6/19.

★†**Ala., Talladega**—War Dpt., 20 St. and Constitution Ave. N.W., Wash., D. C., expansion ammunition storage facilities, magazines, guard house fencing, shelters, railroads, roads, etc., Anniston Ordnance Depot, to Dunn Constr. Co., Inc., Chamber of Commerce Bldg., Birmingham, and John S. Hodgson & Co., N. Perry St., Montgomery. **$2,109,640.** J. B.

PUBLIC BLDGS. (Contracts Awarded, Cont'd.)

Converse & Co., Wilson Bldg., Mobile, and A. C. Polk, Protective Life Bldg., Birmingham, archts. and engrs.

★†**Ark., Jacksonville**—War Dpt., 20 St. and Constitution Ave. N.W., Wash., D. C., design and construction fuse and detonator plant, to Ford, Bacon & Davis, 39 Bway., New York, N. Y. Est. **$33,500,000.** CD 6/24—ENR 7/26.

Calif., Berkeley — Regents University of California, rein.-con. medical-physics building, to J. E. Branagh, 105 Sheridan Ave., Piedmont. **$161,470.** Bids 6/26. CD 6/12.

Calif., Carmel—Trustees Carmel Unified School Dist., high school gymnasium, cafeteria, etc. to H. C. Geyer, 787 Munros St., Monterey, **$156,438.** Bids 7/1. CD 6/23—ENR 10/24.

★†**Calif., San Diego**—Defense Plant Corp., Wash., D. C., constructing, equipping buildings, to Consolidated Aircraft Corp., 3202 Pacific Hy. **$2,916,014.**

†**Colo., Denver**—U. S. Eng., 1709 Jackson St., Omaha, Neb., 500 men reception center, 18 buildings, 11 barracks, mess hall, recreational building, Fort Logan, to Bradbury & Marchant, Albuquerque, N. M., **$185,230.** Bids 6/30. CD 6/20.

†**Colo., Denver**—U. S. Eng., 1709 Jackson St., Omaha, Neb., armament and instrument inspection and adjustment building, Lowry Field, to Brown & Schrepferman, Inc., 240 Washington St., Denver, **$99,847.** Bids 6/27. CD 6/24.

†**Colo., Fort Logan**—U. S. Eng., 1709 Jackson St., Omaha, Neb., reception center, various buildings, to Bardbury & Merchant, Albuquerque, N. M., **$185,320.** Bids 6/30. CD 6/25.

Conn., Washington — Town, Dr. F. W. Weserbe, chn. building Comm., 2 story, 60x94 ft., 110x111 ft. brick, steel high school, to A. F. Peaslee, Inc., 15 Lewis St., Hartford. Est. **$160,000.** Sears & Foote, 119 E. 40 St., New York, N. Y., archts. Bids July 8.

★**D. C., Wash.**—Alley Dwelling Housing Auth., Wash., D. C., 200 unit housing, Stoddard Dwellings, to Constr. Eng. Corp., 6 W. Eager St., Baltimore, Md., **$746,104.**

★†**Fla., Jacksonville**—Yards & Docks, Navy Dpt., Wash., D. C., 400 new family home units, Naval Base Reservation for families of enlisted men and industrial works, to Geo. D. Auchter, Duval Eng. & Constr. Co., and Batson Cook Co., foot of E. Adams St., Jacksonville, **$850,000** to **$1,000,000.** Awarded 6/5.

★†**Fla., Starke**—Con. Q.M., Camp Blanding, barracks, recreational buildings, chapels, officers' quarters, nurses' mess, to Watt & Sinclair of Florida, Palm Beach. **$1,023,774.**

†**Ga., Macon**—War Dpt., 20 St. and Constitution Ave. N.W., guest house, 2 motor repair shops, 3 recreation buildings, hospital, 6 day rooms, 7 magazines, to E. A. Bowen, Macon, **$225,760.** CD 5/9—ENR 5/15.

†**Ga., Macon**—War Dpt., 20 St. and Constitution Ave. N.W., Wash., D. C., replacement center, Camp Wheeler, to Wheatley & Mobley, 718 Reynolds St., Augusta. **$487,197.**

†**Ill., Fort Sheridan**—War Dpt., 20 St. and Constitution Ave. N.W., Wash., D. C., ordnance repair shop and boiler house, to Chell & Anderson Co., 176 W. Adams St., Chicago. **$68,980.** CD 7/2—ENR 7/10.

†**Ill., Great Lakes**—Navy Dpt., 18 St. and Constitution Ave. N.W., Wash., D. C., Naval Training Station addn., to Henry Ericsson Co., 228 N. LaSalle St., Chicago, **$260,000.** CD 6/5—ENR 6/12.

★†**Ill., Joliet**—War Dpt., 20 St. and Constitution Ave. N.W., Wash., D. C., constructing, designing plant for production lead azide, Kankakee Ordnance Works, to Stone & Webster Eng. Corp., 90 Broad St., New York, N. Y. **$868,967.** E. I. DuPont de Nemours & Co., DuPont Bldg., Wilmington, Del., will operate.

★†**Ill., Scott Field (Belleville)**—U. S. Eng., 816 U. S. Courthouse and Customhouse, St. Louis, Mo., barracks, day rooms, supply rooms, mess for guard house area, mess halls and cafeteria, administration buildings, fire station, guard house, post exchanges, service club, recreation buildings, theatre, warehouses, 1 commissary, infirmaries, dental clinic, to O'Driscoll & Grove, Inc., 247 Park Ave., New York, N. Y., and Statler Hotel, St. Louis, Mo., **$1,620,000.** CD 6/26—ENR 7/3.

★†**Ill., Scott Field (Belleville P. O.)**—U. S. Eng., 816 U. S. Courthouse and Custom House, St. Louis, Mo., 6 radio school buildings, Airfield, to O'Driscoll & Grove, Inc., 247 Park Ave., New York, N. Y., and Statler Hotel, St. Louis, Mo., **$990,000.** CD 6/27—ENR 7/3.

†**Ill., Scott Field**—U. S. Eng., 816 Court House and Custom House, St. Louis, Mo., 2 boiler houses and steam distr. sys. to 6 radio schools and other buildings, U. S. Airfield, to Daniel J. Keating Co., 613 South 24 St., Phila., Pa. **$269,000.** Bids 6/27 rejected. CD 7/3—ENR 7/10.

†**Ky., Danville**—War Dpt., 20 St. and Constitution Ave. N.W., Wash., D. C., 3 barracks, 2 mess halls, 2 shops, 2 officers' quarters, guard house, red cross buildings, firehouse and cold storage buildings, State Hospital, Herrington Lake, to Gilson-Taylor, Inc., 7555 East 3 St., Lexington. Est. **$372,319.** CD 7/3—ENR 7/10.

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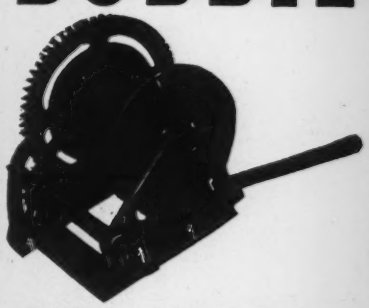

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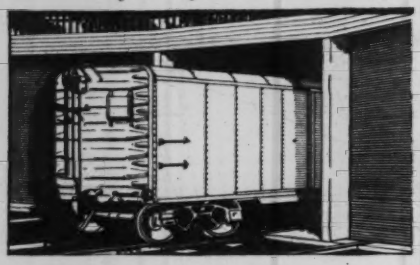

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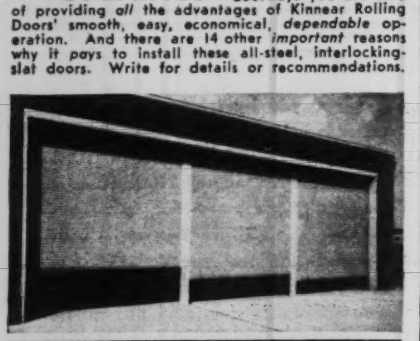

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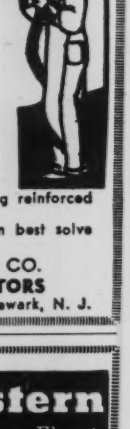

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PUBLIC BLDGS. (Contracts Awarded, Cont'd.)

†**Kan., Fort Riley**—War Dpt., 20 St. and Constitution Ave. N.W., Wash., D. C., 3 warehouses, 1 repair shop with 10 ft. crane, 3 barracks, mess hall, storehouse, recreation building, officers quarters and mess, for Second Cavalry Div. also 3 barracks, mess hall storehouse, recreation building steel igloo magazines and inflammable storage building for anti tank troops, to Mont. J. Green, Manhattan, **$273,000.** CD 7/14.

†**Kan., Marysville**—Civilian Conservation Corps., 13 St. and Pennsylvania Ave. N.W., Wash., D. C., automobile repair building, to Kingery Constr. Co., 1941 Y St., Lincoln, Neb., **$48,000.** CD 11/26—ENR 11/28.

†**Ky., Lexington** — Con. Q.M., Lexington, storage buildings, test buildings, loading platform, utilities, roads, Signal Corps Depot, to Fleischer Eng. Constr. Co., Dun Bldg., Buffalo, N. Y. **$445,731.**

★†**Ky., Louisville**—Federal Works Agency, Wash., D. C., 62 dwellings, to Whittenberg Constr. Co., 2214 S. Floyd St. **$546,000.**

La., Monroe—Power plant and distr. sys., to A. M. Lockett & Co., New Orleans. **$100,000.** Bids 7/8, awarded 7/9. CD 6/12.

†**La., Shreveport**—U. S. Eng., Vicksburg, mobilization housing, Barksdale Field, incl. 20 barracks, 5 recreational buildings, 5 administartion buildings, 4 storehouses, 1 infirmary, 5 miscellaneous buildings, to Glassell-Taylor Co., 318 Carondelet St., New Orleans, **$411,988.** Awarded 7/5.

†**Md., Aberdeen**—War Dpt., 20 St. and Constitution Ave. N.W., Wash., D. C., finance building, hospital barracks, motor shed, bituminous roads, U. S. Proving Grounds, to Irwin & Leighton, 1505 Race St., Phila., Pa. Est. **$250,000.** Bids 7/7. CD 6/23—ENR 6/26.

†**Md., Baltimore**—Con. Q.M., Fort McHenry, tool experimental laboratory building, motor transport school and auditorium, to Henry W. Horst Co., 15 and Race Sts., Phila., Pa. **$300,000** plus. CD 7/1—ENR 7/10.

†**Md., Fort George G. Meade**—Con. Q.M., arena, shop and 7 miscellaneous buildings, shops, grease and inspection rack, oil house, to Bass Eng. & Constr. Co., 2832 E. Grand Blvd., Detroit, Mich. Est. **$326,555.**

†**Mass., Chelsea**—Yards & Docks, Navy Dpt., Wash., D. C., Naval Hospital addn., to Walsh Bros., 150 Hampshire St., Cambridge. Est. **$150,000.** CD 4/4—ENR 4/10.

†**Mich., Battle Creek**—War Dpt., 20 St. and Constitution Ave. N.W., Wash., D. C., motor repair shops, grease and inspections racks, oil houses, wash racks, administration buildings, Fort Custer, to Owen Ames Kimball Co., 38 Pearl St. N.W., Grand Rapids. **$374,400.**

★†**Mich., Ferndale** — Defense Plant Corp., Wash., D. C., plant for production aircraft engine parts, to N. A. Woodworth Co., Ferndale. **$976,344.**

★†**Miss., Hattiesburg**—Con. Q.M., Camp Shelby, miscellaneous buildings, to Perry Constr. Co., Philadelphia, **$775,467.** Bids 6/25. CD 6/6—ENR 6/12.

★†**Miss., Hattiesburg** — Con. Q.M., Camp Shelby, June 25, ice plant, also sheds, to A. H. Guion & Co., Kinney Bldg., Charlotte, N. C., **$98,585** and **$137,541** respectively; motor repair shop, to Perry Constr. Co., Philadelphia, Miss., **$317,500.** Grand total $553,626. CD 6/19.

†**Mo., Rolla**—Con. Q.M., Fort Leonard Wood, depot company building, ordnance buildings, magazine, day rooms, officers' mess, patients' recreation building, ambulance, garage, quartermaster's building, post finance building, fire station, to Tulsa Rig, Reel & Mfg. Co., Philtower Bldg., Tulsa, Okla. **$316,100.** Bids 6/25. CD 6/17—ENR 6/19.

★†**Mo., Rolla** — Con. Q.M., Fort Leonard Wood, motor repair shops, grease and inspection racks, oil houses, wash racks, to Tulsa Rig, Reel & Mfg. Co., Philtower Bldg., Tulsa, Okla. **$571,600.** Bids 6/27. CD 6/17—ENR 6/19.

★†**Mo., St. Louis County (St. Louis, P. O.)**—Emerson Electric Mfg. Co., W. S. Symington, pres., 1824 Washington Ave., construction buildings for manufacturing airplane gun turrets, etc., adjacent to 8100 Florissant Rd., and Wabash Ry. tracks, St. Louis Co., to Austin Co., Arcade Bldg., St. Louis, and 16,112 Euclid Ave., Cleveland, O. Est. **$10,000,000.** War Dept. will finance. CD 6/26—ENR 7/3.

★†**N. J., Fort Dix**—Con. Q.M., 10 motor repair shops, 4 grease racks, 4 oil houses, 4 wash racks, to Christensen & La Fountain, 1140 E. Jersey St., Elizabeth. Items 1 and 2, **$637,000.** Bids 6/27. CD 6/25—ENR 7/3.

†**N. J., Metuchen**—War Dpt., 20 St. and Constitution Ave. N.W., Wash., D. C., garage, Raritan Arsenal, to Gumina Building & Constr. Co., Inc., 14 Georges Rd., New Brunswick. **$67,645.**

★**N. Y., Brooklyn**—New York City Housing Auth., G. Swope, chn., 122 E. 42 St., New York, superstructures, appurtenances, Fort Greene Houses, Proj. NYS-1, Prince, Tillary and St. Edwards Sts., Auburn Place, N. Portland Park, Carlton Park and Myrtle Aves., to D-M-W Contg. Co., Inc., 2058 Fulton St. **$9,437,000.** CD 6/12—ENR 6/19.

★†**N. Y., Kendaia**—War Dpt., 20 St. and Constitution Ave. N.W., Wash., D. C., ammunition storage depot, incl. magazines, shelters, railroads, to Poirier & McLane Corp., 33 W. 42 St., and J. W. Harris & Assoc., Inc., 30 Rockefeller Plaza, New York, N. Y. Est. **$6,658,454.** W. S. Lozier, 10 Gibbs St., Rochester, archts. and engrs.

†**N. Y., Madison Barracks**—Con. Q.M., 2 motor repair shops, grease and inspection rack, oil house, administration building, to Brown & Hand Constr. Co., Inc., 401 North Midler Ave., Syracuse. **$99,512.** Awarded 6/27.

†**N. Y., Pine Camp**—Con. Q.M., 2 barracks, 5 chapels, 1 administration building, medical barrack, to Brown & Rand Constr. Co., 401 N. Midler Ave., Syracuse. $159,996. Bids 6/20, awarded 6/28. CD 6/10—ENR 6/12.

†**Okla., Fort Sill**—Con. Q.M., 17 mobilization buildings, roads, etc., to W. Frank Little Constr. Co., Amarillo. **$189,500.** Bids 6/25, awarded 6/27.

†**Okla., Fort Sill**—Con. Q.M., 20 buildings for cantonment hospital, etc., walkways, walks, steam distr. sys., to W. Frank Little Constr. Co., Amarillo, Tex. **$305,798.** Bids 6/25, awarded 6/27.

★†**Okla., Fort Sill**—War Dpt., 20 St. and Constitution Ave. N.W., Wash., D. C., motor transport facilities, shops, warehouse, utilities, to W. R. Grimshaw & Co., Philtower Bldg., Tulsa. **$1,076,650.**

★†**Pa., Mifflin Twp.**—Allegheny Co. Housing Auth., County Office Bldg., Pittsburgh, 700 families defense housing for FWA, to Lloyds Builders, 185 N. Wabash Ave., Chicago, Ill., and Law & Finance Bldg., Pittsburgh. Est. **$1,871,000.** CD 6/24—ENR 6/26.

★†**Pa., Pittsburgh**—See Proposed Work.

★†**Pa., Stowe Twp.**—Federal Works Agency, Wash., D. C., 250 unit defense housing project, to Mellon Stuart Co., 210 E. Parkway, N.S. Pittsburgh. **$973,000.** CD 6/26—ENR 7/3.

★†**S. C., Charleston**—War Dpt., 20 St. and Constitution Ave. N.W., Wash., D. C., overseas discharge and replacement depot, to M. B. Kahn Constr. Co., 714 Lady St., Columbia. **$532,700.** Awarded 7/7. CD 6/30—ENR 7/3.

★†**S. C., Columbia**—Constr. Q.M., Fort Jackson, buildings, Inv. 6403-41-52, from J. A. Jones Constr. Co., 209 W. 4 St., Charlotte, N. C. **$540,000.**

†**Tex., Abilene**—Con. Q.M., Camp Barkley, 2 motor repair shops, 1 grease and inspection rack, 1 oil house, etc., to Rose Constr. Co., Inc., Abilene. **$61,000.** Bids 6/26, awarded 6/27.

Tex., Beaumont—Bd. Educ., 2 story, 65x220 ft., rein.-con., brick science building, to Winter-King, San Jacinto Life Bldg., Beaumont. **$157,749.** CD 6/18.

★†**Tex., Dallas**—Dallas Housing Auth., 2525 Lucas Dr., housing, Tex. 9-4, to Norgaard & Shaw and Vilbig Bros., Inc., 2933 N. Henderson St. **$749,875.** Bids 7/10. CD 6/12—ENR 6/19.

†**Tex., Fort Bliss**—Con. Q.M., neurophuchtiatric Ward, Wm. Beaumont General Hospital, to Jos. E. Morgan & Sons, 210 N. Campbell St., El Paso. **$340,389.** Bids 7/1. CD 6/27—ENR 7/3.

†**Tex., Hitchcock**—Con. Q.M., Camp Wallace, administration building, barracks, 3 chapels, theatre, patients' recreation building, ambulance garage, dental clinic, motor shed, strong room, motor repair shop, to Charles H. Oehler, 5007 Bway., Galveston. **$276,825,** cost-plus basis. CD 7/7—ENR 7/10.

★†**Tex., Houston**—U. S. Eng., Federal Bldg., Galveston, additional temporary buildings, to Tellepsen Constr. Co., 3900 Clay Ave. **$688,194.** CD 6/27—ENR 7/3.

★†**Tex., Houston** — Hughes Tool Co., 300 Hughes St., constructing plant for production landing gears for bombers, to Southeastern Constr. Co., 3802 Calhoun Rd. Est. **$4,000,000.** Defense Plant Corp. will finance. R. J. Cummins, Bankers Mortgage Bldg., Houston, engr. CD 7/10, under CA.

†**Tex., San Antonio**—Con. Q.M., emergency construction Project 3, Normoyle Quartermaster Depot, to A. E. Rheiner & Sons, Builders Exch. Bldg., San Antonio. **$205,369.** Bids 6/24, awarded 6/26.

★†**Tex., San Antonio**—War Dpt., 20 St. and Constitution Ave. N.W., Wash., D. C., quartermaster depot, 36 buildings, utilities, Normoyle Quartermaster Depot, to American Constr. Co., Rusk Bldg., Houston. **$888,690.**

★†**Tex., San Antonio**—War Dpt., 20 St. and Constitution Ave. N.W., Wash., D. C., general depot, warehouse, sheds, magazines, fencing, etc., Fort Sam Houston, to McKenzie Constr. Co., Smith Young Tower, San Antonio. **$97?,184.**

†**Tex., San Antonio**—Con. Q.M., Fort Sam Houston, superstructure hospital annex with military area, to Walsh & Burney, 928 North Flores St., **$346,163;** fdn. work by force account. Est. $475,000. Awarded 7/5.

★†**Tex., Wichita Falls**—U. S. Eng., Cotton Exch. Bldg., Dallas, general contract, 79 buildings for hospital unit, Aviation Mechanic School, to Robert E. McKee, 1918 Texas St., El Paso. **$1,758,359.** CD 7/1—ENR 7/10.

†**Utah, Ogden**—U. S. Eng., 751 S. Figueroa St., Los Angeles, Calif., 16 temporary buildings, Hill Field Arsenal and Airport, to Enoch Chytraus Co., 1000 Yale Ave., Salt Lake City. **$233,981.** Bids 6/21. CD 6/19.

†**Utah, Ogden**—Con. Q.M., Ogden Ordnance Depot, locomotive repair shop and utilities thereto, Ordnance Depot, to Jacobsen Constr. Co., 724 South 3 St., Salt Lake City. **$233,470.** Bids 6/27.

PUBLIC BLDGS. (Contracts Awarded, Cont'd.)

+Va., Arlington—War Dpt., 20 St. and Constitution Ave. N.W., Wash., D. C., storage warehouse, to John McShain, 17 and Bruce Sts., Phila., Pa. **$1,640,000.**

+Va., Camp Lee—War Dpt., 20 St. and Constitution Ave. N.W., Wash., D. C., quartermasters' school for 900 officers, recreement center, etc., to Doyle & Russell, Central Natl. Bank Bldg., and Wise Contg. Co., 122 N. 8 St., Richmond. **$2,557,348.**

+Va., Fort Eustis—War Dpt., 20 St. and Constitution Ave. N.W., Wash., D. C., 13 additional buildings, to James L. Barnes Constr. Co., Greensboro, N. C. **$197,000.**

+Va., Norfolk—Yards & Docks, Navy Dpt., Wash., D. C., chain storage slab, Army Terminal Temporary Storehouse, officers quarters, Norfolk Naval Base, to Byrne Organization, 2701 N. Fitzhugh St., Dallas, Tex. **$819,500.** CD 4/4—ENR 4/10.

+Va., Norfolk—Yards & Docks, Navy Dpt., Wash., D. C., rein.-con. warehouse, to Rust Eng. Co., Clark Bldg., Pittsburgh, Pa., **$1,300,000.** CD 4/4—ENR 4/10.

+Va., Norfolk — Navy Dpt., 18 St. and Constitution Ave., N.W., Wash., D. C., warehouses, Naval Operating Base, to Virginia Eng. Co., Newport News, **$1,421,000.**

+Va., Quantico—Yards & Docks, Navy Dpt., Wash., D. C., contagious ward, post shop, temporary buildings, U. S. Marine Barracks, to Harwood-Nebel Constr. Co., 1520 K St. NW., Wash., D. C. **$775,500.** CD 5/28.

+Wash., Fort Lewis—War Dpt., 20 St. and Constitution Ave. N.W., Wash., D. C., motor repair shops, warehouses, facilities, to Peufel & Carlson, Skinner Bldg., Seattle. **$1,033,221.** CD 6/25—ENR 7/3.

+Wash., Fort Lewis—War Dpt., 20 St. and Constitution Ave. N.W., Wash., D. C., ordnance shop, boiler house, 4 ordnance warehouses, Inv. $105-41-109, to Sound Constr. & Eng. Co., Northern Life Tower, Seattle. **$92,-**92. Bids 6/17.

+W. Va., Morgantown—War Dpt., 20 St. and Constitution Ave. N.W., Wash., D. C., constructing, designing for expansion ordnance works, to E. I. DuPont de Nemours & Co., DuPont Bldg., Wilmington, Del. **$15,848,000.** CD 6/16—ENR 6/19.

+Wis., Manitowoc — Manitowoc Housing Auth., 400 unit housing for PBA, to Froening Eng. Corp., 4500 W. Mitchell St., Milwaukee. **$1,198,000. (Correction**—contractor) CD 4/8—ENR 4/10, under CA.

N. S., Halifax—Secretary Dpt. Munitions & Supply, Ottawa, Ont., frame buildings at Wellington Barracks, to R. and A. Parsons, Windsor. **$129,000.** CD 3/14—ENR 3/20.

N. S., Halifax—Navy League of Canada, 329 Bay St., Toronto, sailors' home, Hollis St., to A. E. Farley, 30 Russell Ave., Ottawa, Ont. **$150,000.**

Ont., Parry Sound and **Nobel** — Secretary Wartime Housing Ltd., 55 York St., Toronto, 250 family dwellings Perry Sound and 20 at Nobel, near Parry Sound, to L. C. Scott Constr. Co., Ltd., 330 Bay St., Toronto, about **$300,000.** Bids 6/19. CD 5/14.

Que., Quebec City—Dpt. National Defense, Ottawa, Ont., primer plant, Arsenal, to M. Cauchon, Ltd., 325 de La Salle St. **$57,000.**

Que., Quebec City—Dpt. National Defense, Ottawa, Ont., altering carpenter shop, to Magliore Cauchon, Ltd., 325 de La Salle St., Quebec. About **$57,000.**

COMMERCIAL BUILDINGS

PROPOSED WORK

Ala., Montgomery—Capital City Hotel Co., c/o Dr. S. D. Suggs, pres., Shepherd Bldg., 12 story, brick hotel.

Ala., Opelika—Southern Bell Telephone & Telegraph Co., Hurt Bldg., Atlanta, Ga., plans by Hentz, Adler & Shutze, Candler Bldg., Atlanta, Ga., exchange building.

Calif., Los Angeles—Southern California Telephone Co., 740 South Olive St., soon lets contract, 2 story, 105x135 ft. Whitney Bldg., addn. $185,000.

Conn., Fairfield—W. A. Malone, Inc., 989 Main St., Bridgeport, residential development. Over $150,000. FHA.

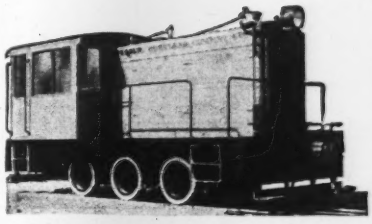
Del., Wilmington—Owner, c/o S. Abramson, archt., 2034 Locust St., Phila., Pa., theatre. $150,000.

Ind., Anderson—South Anderson Imprvt. Co., 1705 Main St., 40 or more homes. $175,000 or more. CD 12/26—ENR 1/2.

Ind., Edgewood—Edgewood Development Co., W. Donnelley, pres., R.R.4, Anderson, 30 or more residences in Edgewood, Edgewood Heights, East Edgewood and Edgewood Hills addns. $175,000 or more. E. R. Watkins, R.R.4, Anderson, archt.

Ind., Indianapolis—Lyndale Constr. Co., 515 E. Manhattan Ave., 50 or more homes. $250,000 or more.

Ill., East Alton—Western Cartridge Co., East Alton, soon lets contract, 3 story, 40x118 ft. office building addn. of cartridge plant, incl. 36x36 ft. dining room, 3 story lobby addn., etc. H. Abbitt, 315 N. 7 St., St. Louis, Mo., archt.



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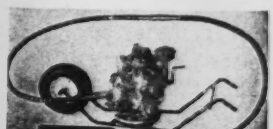

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COMMERCIAL BLDGS. (Proposed Work, Cont'd.)

Ill., Oak Lawn—Lucas Theatre Co., 220 S. State St., Chicago, plans by R. B. Blass, 910 S. Michigan Ave., Chicago, theatre, 95 St. and Cicero Ave. $175,000.

La., Leesville—Southern Bell Telephone & Telegraph Co., Hurt Bldg., Atlanta, Ga., plans by Hentz, Adler & Shutze, Candler Bldg., Atlanta, exchange building.

La., New Orleans—Southern Bell Telephone & Telegraph Co., Hurt Bldg., Atlanta, Ga., plans by Hentz, Adler & Shutze, and J. Warren Armistead, 1330 Candler Bldg., Atlanta, Ga., exchange building.

La., New Orleans—at office Jones, Roessle & Olschner, Maison Blanche Bldg., archts., soon let contract, brick, steel, drive-in supermarket and grocery, Washington Ave. and S. Jefferson Davis Parkway, for Capitol Stores, Inc., 2654 St. Louis St. Extended date. CD 7/1—ENR 7/10.

Mass., Leominster — Leominster Hospital, Hospital Rd., sketches by Kendall Taylor & Co., 221 Columbus Ave., Boston, brick, steel hospital addn., Hospital Rd. $150,000.

Miss., Biloxi—Gaynell Corp., Biloxi, 217 residences.

Miss., Meridian—Meridian Home Builders, c/o Frank Whitfield, pres., 65 homes western part of city. $155,000, Chris, Risher, Jackson archt.

Mo., St. Louis—Unity Hall Assoc., Grand and Page Blvd., indefinitely postponed construction 2 story, bsmnt., 72x105 ft. brick, concrete bowling alleys, etc. W. J. Theodor, 2754 Accomac St., archt. CD 6/26—ENR 7/3.

Mo., Springfield—Baptist Church, c/o Dr. B. L. Davis, pastor, 848 S. Weller St., church. $276,000.

Mont., Great Falls—John McLaughlin, Great Falls, 25 new homes. $200,000.

Neb., Omaha—Better Built Homes, Inc., c/o H. R. Lebens, Service Life Bldg., 27 new modern homes, 41 and Y Sts. $150,000.

★**N. J., Camden**—Owner, c/o D. W. Wright, archt., Woodland Rd., Maplewood, 350 residences. Over $1,000,000.

N. J., Linden—Simmons Co., 230 Park Ave., New York, plans by A. A. Kaufmann, 259 N. Broad St., Elizabeth, 2 story, bsmnt., 60x200 ft., brick, steel office building and gate house, Brunswick Ave. $150,000. E. D. Powers, 24 Branford Pl., Newark, engr.

N. J., Newark—American Can Co., 230 Park Ave., New York, N. Y., brick, steel office building addn., Elizabeth Ave. $250,000. C. G. Preis, 230 Park Ave., New York, N. Y., engr.

N. J., Newark—St. Michael's Hospital, 306 High St., soon let contract, 5 story, bsmnt., 100x100 ft., brick, steel maternity hospital, High St. $450,000, P. C. Reilly, 44 Walker Rd., West Orange, archt. CD 1/17—ENR 1/25.

N. Y., Brooklyn—Corbin Gardens Inc., 50 Court St., plans by Seelig & Finkelstein, 153 Pierrepont St., 6 story, 80x302 ft. apartment, 142-76 Corbin Pl. $360,000.

N. Y., Brooklyn—A. Hartman, 123 Cornelia St., plans by Kavy & Kavovitt, 44 Court St., 6 story, 90x139 ft. apartment, 198-210 Congress St. $240,000.

N. Y., Far Rockaway—Brooklyn Jewish Home for Convalescents, Inc., 130 Clinton St., Brooklyn, plans by M. N. Weinstein, 93 Court St., Brooklyn, 1 story convalescent home, 601 Beach 9 St. $175,000.

N. Y., Flushing—Princeton Developing Corp., 16 Court St., Brooklyn, plans by P. Birnbaum, 303 W. 42 St., New York, 6 story apartment, 103-26 88 Rd. $385,000.

N. Y., Forest Hills—Fenton Apartments, Inc., 44 Court St., Brooklyn, plans by Morris Rothstein, 391 Fulton St., Brooklyn, 6 story apartment, 69-40 Yellowstone Blvd. $480,000.

N. Y., Forest Hills—Normandie Apartments, Inc., 44 Court St., Brooklyn, plans by Morris Rothstein, 391 Fulton St., Brooklyn, 6 story apartment, 106 15 Queens Blvd. $490,000.

N. Y., Forest Hills—Sixty Third Building Corp., 50 Lefferts Ave., Brooklyn, plans by Seelig & Finkelstein, 153 Pierrepont St., Brooklyn, two 6 story apartments, 63-109 and 63-89 Saunders Sts. $555,000.

N. Y., Queens Village—Little Sisters of Poor, Bushwick and DeKalb Ave., Brooklyn, plans by H. V. Murphy, 1 Hanson Place, Brooklyn, 4 story convent, 110-39 Springfield Blvd. $150,000.

O., Columbus—Weber Park South, Inc., 35 E. Gay St., forty-nine 1 story homes, Weber Rd. $150,000.

O., Warren — First Presbyterian Church, 2 story, brick church addn. $150,000.

Pa., Erie—C. J. Schwartz, 2113 Sassafras St., 50 dwellings, Peach St. exten., south of city limits. $225,000-$250,000.

Pa., Phila.—Edward Kerr, 6701 N. Broad St., 79 additional residences. Over $150,000.

Pa., Zelienople—Old Peoples Lutheran Home, W. F. Pfeiffer, supt., 2 story, bsmnt., brick, steel dormitory and chapel. $150,000. A. N. Steinmark, 922 Empire Bldg., Pittsburgh, archt.

★**R. I., Warwick**—Palestine Temple of the Shrine, c/o Jackson, Robertson & Adams, archts., 1216 Turks Head Bldg., Providence, brick, steel hospital, Buttonwoods Sect. $500,000. Office of Hollis French, 210 South St., Boston, Mass., engrs.

Tenn., Memphis—South... Bowling Lan... 299 N. Cleveland St., plans... by G. Mahan, Jr., Sterick ... bowling alley. $150,000.

Tex., Corpus Christi—Y. M. C. A., Corp... Christi, plans by O. F. Jo...son, Amusg. Bldg., 2 and 3 story Y. M. C. A. ...uilding. $250,000.

Tex., Dallas—Southern Methodist Universi... U. Lee, pres., 11 sorority houses, campus, $160,000. M. Lemmon, Tower Petroleum Bldg., archt.

Tex., Fort Worth—Harris Memorial Methodist Hospital, 1300 W. Cannon St., plans by Wyatt C. Hedrick, 1005 1st Natl. Bank Bldg., 2 upper floors of existing 8 story building, utilities, elevator, etc. $150,000.

★**Tex., Galveston**—R. Waverly Smith Memorial Pavilion, Avenue B and 8 St., plans by Samuel Hannaford & Sons, Dixie Terminal Bldg., Cincinnati, O., and Eads soon, 4 story, brick, hollow tile, rein.-con. hospital, $600,000. R. R. Rapp, Guaranty Trust Bldg., supervising archt.

Tex., Houston—Carrolton Woods Co., M. & M. Bldg., dwellings. $250,000.

Wash., Seattle—Virginia Mason Hospital Assn., 1101 Terry Ave., plans by Graham & Painter, Dexter Horton Bldg., 2 story hospital addn. $200,000.

★**Wash., Seattle**—Balch & Seizer, 1407 Exchange Bldg., plans by Thomas, Grainger and Thomas, Arcade Bldg., 200 homes, 2... Ave. N.E. and E. 80 St. $360,000. Graeser, Gardner and Hitchings, Arctic Bldg., engrs.

Wis., Stoughton—Stoughton Hospital, plans by J. J. Flad & T. H. Flood Assoc., 1... Langdon St., Madison, 3 story, bsmnt. hospital addn.

N. S. Glace Bay—Hub-Cooperative Housing Group, Inc., Glace Bay, dwellings. $150,000.

★**Que., Charlesbourg**—J. C. Drouin, archt., 104 Rue St. Jean, Quebec City, bids soon, 3 story, 69x156 ft., rein.-con. juniorate, main sect. 3 story, 69x860 ft. and 50x200 ft. annex, chapel, hospital and solarium for Institute des Freres Manisteo, Iberville. About $500,000.

Que., Quebec City—Quebec Seminary Administration, 14 Blvd. De L'Entente, plans by E. Cormier, 203 Mansfield St., Montreal, college. $300,000.

BIDS ASKED

Wash., Bremerton—Osran Amusement Co., Skinner Bldg., Seattle, 1 story, 140x137 ft. masonry theater. $300,000. McClelland & Jones, Republic Bldg., archts. CD 13/30—ENR 7/2.

CONTRACTS AWARDED

Calif., Inglewood—Inglewood Properties, 5200 W. Imperial Hy., 54 five room dwellings. Owner builds. **$161,800.**

Kan., Wichita—R. H. Garvey, Bitting Bldg., sixty-six 1 story, bsmnt., 23x38 ft. residences, North Estelle, Volutsia, and Erie Sts., to E... & Vollmer, 850 N. Main St. Est. approx. **$150,000.**

Kan., Wichita—General Housing, Inc., 22... E. 9 St., 50 one story residences to M. ... Parker, 1003 Mentor St. Est. approx. $150,...

Md., Baltimore—Westover Manor, Inc., 14... Eye St. N.W., Wash., D. C., 6 apartments, 108 suites, 2 story, bsmnt., to A. L. Goode, 1427 Eye St. N.W., Wash., D. C. Est. $225,... W. N. Denten, 1427 Eye St. N.W., Wash., D. C., archt.

Mass., Fitchburg—New England Telephone & Telegraph Co., 50 Olive St., Boston, 2 story, bsmnt., 83x105 ft., brick, steel exchange and office, Main St., to H. P. Cummings Construction Co., 14 Prospect St., Ware. Est. $150,000. CD 5/19—ENR 5/22.

Mass., Lynn—Harding & Davis, Harrison St., residences, City Infirmary Property and Birch Brook Village. Owner builds. Cost **$150,000.** 10 in progress.

N. J., Bergenfield—Martin Dromley, Brookview Terrace, residential development, thirty 2 story, bsmnt., 24x33 ft., Brookview Terrace, separate contracts. **$150,000.** CD 5/28—ENR 6/5.

★**N. J., East Paterson**—John Graham, Jr., 537 Grand Ave., Leonia, residential development 40 (ultimately 300) 2 story, bsmnt., 24x33 ft. brick, stone veneer homes, Rose Rd., separate contracts. **$200,000.** Total $1,500,000. CD 6/3—ENR 6/5.

N. J., Elizabeth—Realty Transfer Co., 5... S. Broad St., 2 story, bsmnt., 97x242 ft., brick steel store, Broad St., to D'Elia Building Co., Inc., 2761 Hudson Blvd., Jersey City. ... 5/19.

N. J., Newark—St. Columbus Roman Catholic Church, 25 Thomas St., 3 story, bsmnt., brick, steel, front and rear addns. to school, Pennsylvania Ave., to E. M. Waldron, Inc., 40 Park Pl. **$250,000.** Fanning and Sha... 49 Ward St., Paterson, archts.

N. J., Paulsboro and **Runnemede** — C. ... Fish & Assoc, Inc., Architects Bldg., Phila., Pa., 42 residences. Owner builds. Over $1... **000.** H. B. Pennill, Drexel Hill, Pa., archt.

N. J., Rutherford—One Hundred Fifty-Four Union Ave. Corp., 140 Glenwood Ave., Jersey City, 3 story, bsmnt., 67x212 ft., brick, ... apartment, Union Ave., separate contracts. **$150,000.** I. Naftali, 910 Bergen Av., Jersey City, archt. CD 6/2—ENR 6/5.

N. Y., Astoria—Imperial Homes, Inc., 38... Main St., Flushing, 43 two story homes, ... St. Owner builds. **$172,000.** J. Unger, 38... Main St., Flushing, archt.

COMMERCIAL BLDGS. (Contracts Awarded, Cont'd.)

N. Y., Brooklyn—Yorkshire Homes, Inc., 162 Remsen St., 37 one family homes, Utica Ave. Owner builds. **$177,600.** I. Kallich 161 Remsen St., archt.

N. Y., Elmhurst (sta. Flushing)—Bruson Homes, 40-23 62 St., 20 one family homes, Van Horn St. and 52 Ave. Owner builds. $150,000. M. M. Elkind, 40-09 82 St., Jackson Heights, archt.

N. Y., Flushing—Gross Morton Garden Corp., 160 16 Jamaica Ave., Jamaica, 29 one-family homes, 196 St. Owner builds. **$161,000.** A. E. Allen, 90-04 161 St., Jamaica.

★**N. Y., Forest Hills**—Sixty Third Building Corp., 50 Lefferts Ave., Brooklyn, two 6 story apartments, 63-109 and 63-89 Saunders St., separate contracts. **$555,000.** Seelig & Finkelstein, 153 Pierrepont St., Brooklyn, archts. CD 7/1—ENR 7/10.

N. Y., Queens Village.— Arbor Oaks, Inc., Union Turnpike, 217 St., Springfield, 32 one family homes 217 St., Peck Ave. and 82 Ave. Owner builds. **$240,000.** H. W. Johanson, 62-52 61 St., Ridgewood, archt.

N. C., Gastonia—Mathews Belk Co., Gastonia, store building to Southeastern Constr. Co., 218 W. 2 St., Charlotte, **$150,000.** M. W. Helms, 100 E. Blvd., archt.

★**Pa., Camp Hill**—Abe Lincoln Gup, Yeadon, 200 dwellings, Harvard, Yale and Dickinson Aves. Owner builds. **$1,250,000.**

Pa., Indiana—Bell Telephone Co. of Pennsylvania, J. M. Doremus, in charge, 7 Ave., Pittsburgh, brick, tile, limestone telephone exchange and office building, to Berkebile Bros., 625 Swank Bldg., Johnstown. Est. **$150,000.** P. C. Dowler, 803 Century Bldg., Pittsburgh, archt.

Pa., Phila—M. Kaplan, 1211 Chestnut St., residential construction, Michener and Ellena Sts. Owner builds. Over **$150,000.** CD 4/30—ENR 5/8.

Pa., Phila.—Carl J. Mayer, W. Olney Ave., residential construction. Owner builds. **$150,000.**

Pa., Phila.—Morris Park Constr. Co., Malverne St., residential construction. Owner builds. **$150,000.** CD 2/7—ENR 2/13.

Pa., Phila.—Kerr Constr. Co., 6701 N. Broad St., 79 residences. Owner builds. **$250,000.**

Tenn., Memphis—Sears, Roebuck & Co., W. Arthington and S. Homan Aves., Chicago, Ill., mail order plant, to B. W. Constr. Co., 307 N. Michigan Ave., Chicago, Ill. Est. **$400,000.** Nimmons, Carr & Wright, 333 N. Michigan Ave., Chicago, Ill., archts.

Tex., Beaumont—Sisters of Incarnate Word, Hotel Dieu, Beaumont, 3 story, 99x116 ft., brick, concrete, stone, steel convent and chapel buildings, to G. Sargel, Liberty Bldg. **$150,000.** Steinman & Colman, Liberty Bldg., archts. Bids 6/26. CD 6/6—ENR 6/12.

Wash., Seattle—C. G. Morrison, Amer. Bldg., 50 frame houses, 35 Ave. S.W., and W. Thistle, day labor. **$200,000.** A. Hitchings, Arctic Bldg., engr.

Wash., Seattle—A. H. Ormsby, 5240 17 Ave. N.E., 50 houses, Beacon Ave. and Columbian Way, force account. **$200,000.** P. H. Kirk, 4710 22 Ave. N. E., archt.

Wash., Seattle—E. C. Swanson, 1311 N. 79 St., 50 houses, Columbian Way and Beacon Ave., force account. **$200,000.** P. H. Kirk, 4710 22 Ave. N.E., archt.

Wash., Seattle—R. Seelye, 6845 29 Ave. N.E., 50 houses Beacon Ave. and Columbian Way, force account. **$200,000.** P. H. Kirk, 4710 22 Ave. N.E., archt.

Wash., Seattle—F. R. McAbee, 3425 Stone Ave., 50 frame houses, Columbian Way and Beacon Ave., force account. **$200,000.** P. H. Kirk, 4710 22 Ave. N.E., archt.

Ont., Ottawa—Univesity of Ottawa Seminary, Main St., 4 story, 69x124 ft. seminary addn., to W. D. Aoust, 212 Montreal Rd., Eastview, about **$160,000.** CD 2/28—ENR 4/6.

INDUSTRIAL BUILDINGS

PROPOSED WORK

★**Ark., Stamps**—PLANT—Carter Oil Co., 30 Rockefeller Plaza, New York, N. Y., gas treatment plant. $3,000,000. Arkansas Power & Light Co., lessee.

Ark., West Memphis—COMPRESS, etc.—K. H. Francis, West Memphis, compress and warehouse. $100,000.

Calif., Los Angeles—MARKET—Paul J. Howard, 11,007 National Blvd. W. Los Angeles, 125x235 ft. ranch style market building. Over $40,000. Stiles Clements, 1135 Van Nuys Bldg., archt.

Calif., Los Angeles—PLANT—W. P. Fuller & Co., 135 N. Los Angeles St., plans by Parkinson & Parkinson, 434 Title Insurance Bldg., 1 story, 153x415 ft. plant, corrugated metal exten. walls, concrete fdn. concrete loading docks, 100x155 ft. asphalt paved yard, Ave. 22 and Humboldt St. Over $40,000.

Calif., Oakland—FACTORY—Owner, c/o R. F. Keefer, 770 Wesley Ave., 1 story, 75x104 ft., brick shop factory. $40,000.

Calif., Oakland—Southern Pacific Co., 65 Market St., San Francisco, W. H. Kirkbride, ch. engr., shop addns. $40,000.

Calif., Oleum—ENGINEERING—Union Oil Co., Oleum, engineering and administration buildings. Over $150,000.

Calif., Stockton—PLANT—Stockton Box Co., Stockton plant addns. Over $60,000.

Conn., Fairfield—FACTORY—Rolock, Inc., R. P. Welles, pres., Southport, plans by Lyons & Mather, 211 State St., Bridgeport, 1 story, 100x100 ft., 2 story, 25x40 ft., brick, steel, factory, King's Hy. $40,000. CD 5/15—ENR 5/29.

Fla., Jacksonville—PLANT—Giggs Gas Engine Co., foot of Gibson St., additional plant expansion on Locarno tract south side St. Johns River. Over $150,000.

Ga., Atlanta—STORAGE BARNS—Upchurch Packing Co., c/o F. Upchurch, 19 Brady Ave. N.W., rebuilding storage barns destroyed by fire. Loss $50,000.

Ill., Chicago—FACTORY—John Wood Mfg. Co., 4435 S. Western Ave., 1 story factory. About $50,000. Alschuler and Friedman, 28 E. Jackson Blvd., archts.

★**Ill., East St. Louis (Peoria P. O.)**—PLANT—Caterpillar Tractor Co., 600 W. Washington St., East Peoria, tractor plant, addns., imprvs. $592,000.

★**Ill., Joliet**—FACTORY—American Steel & Wire Co., 208 S. LaSalle St., Chicago, bids soon on fdn. for 2 large factory buildings. Total est. $15,000,000. CD 6/26—ENR 7/3.

Ia., Charles City—PLANT—Iowa Public Serv. Co., 517 5 Ave., Sioux City, plant, switch gear, etc. $90,000.

Ia., Iowa Falls—PLANT—Ralston-Purina Co., 835 S. 8 St., St. Louis Mo., soybean processing plant, $325,000.

La., New Orleans—MARKET—H. G. Hill Stores, Inc., 1001 S. Broad St., plans by Diboll-Kessels & Associates, Baronne Bldg., bids about July 16, general contract masonry and steel frame drive-in super market, Gentilly Rd., Elysian Fields, Fremchman and Foy Sts.

Me., Wiscasset — PLANT — Central Maine Power Co., Green St., Augusta, plans by J. H. and J. C. Stevens, 187 Middle St., Portland, brick, steel, concrete steam electric power plant. Over $100,000.

Md., Baltimore — FOUNDRY — American Brake Shoe and Fdry. Co., 2001 Laurens St., 1 story, 80x320 ft. foundry addn. $250,000. O. D. Conover, 1740 E. 12 St., Cleveland, O., engr. CD 1/15—ENR 1/23.

Mass., Brockton—PLANT—Coca Cola Bottling Co., 244 Centre St., sketches 1 and 2 story, 110x260 ft., brick, steel, concrete plant, Centre St. $100,000. J. M. Shelton, Bona Allen Bldg., Atlanta, Ga., engr.

Mass., Lynn—PLANT—Coca Cola Bottling Co., 30 Washington St., Brighton, sketches by Jesse Shelton, Bona Allen Bldg., Atlanta, Ga., 1 and 2 story, brick, steel, concrete bottling plant, garage, office, etc. Over $40,000.

Mass., Malden — WAREHOUSE — Devoe & Reynolds Co., Inc., Green St., sketches by Parsons & Wait, 234 Boylston St., Boston, brick, steel warehouse addn. to Wadsworth Howland paint plant. $40,000 or more.

Mass., Worcester—BULK OIL TERMINAL—Sun Oil Co, 711 Statler Bldg., Boston, soon lets contract, bulk oil terminal 23x56 ft. warehouse, 72x80 ft. garage and office bldg., 28x45 ft. tanks pumphouse. W. Boylston St. $45,000. CD 6/16—ENR 6/19.

Mich., Dearborn—PLANT—American Blower Co., 8111 Tireman Ave., brick, steel, rein.-con., blower plant addn. $100,000. Giffels & Vallet, Marquette Bldg., Detroit, archts. and engrs.

Mich., Detroit—FACTORY—Ditzler Color Co., 8000 West Chicago Blvd., 3 story, brick, steel, concrete factory addn. $40 000. Harley & Ellington, 1508 Stroh Bldg., engrs.

Mich., Detroit—FACTORY—Redford Tool & Die Co., 1710 Rockdale Ave., 1 story, brick, steel, concrete factory. $70,000. C. R. Jensen, 3757 Gladstone Ave., archt.

★**Mo., St. Louis**—PLANT—American Can Co., 230 Park Ave., New York, N. Y. and c/o J. M. Hall, plant supt., 41 Branch St., St. Louis, soon lets contract production plant, east of Kingshighway Blvd. between Juniata St. and Missouri Pacific R.R. tracks. $1,750,000. C. G. Preis, c/o owner, archt. and engr. CD 6/30—ENR 7/3.

N. J., Trenton—LAUNDRY—Stacy Laundry Corp., Ward Ave., 30x200 ft. laundry, $40,000 with equip. L. S. Kaplan, W. State St., archt.

N. Y., Oakfield—WAREHOUSE—G. W. Haxton & Son, Inc., Webber Ave., storage warehouse. $40,000.

★**O., Canton**—PLANT—Ohio Power Co., 305 Cleveland Ave. S.W., imprvs., will increase electric power capacity at Torrey and Sunnyside, substations near here, $800,000.

O., Cleveland—PLANT—Black Boring & Machine Co., L. G. Black, pres., 4909 Luther Ave., 1 story, 50x150 ft., brick, steel plant. $40,000. E. G. Hoefler, 5005 Euclid Ave., engr.

O., Cleveland — FACTORY, etc. — Broden Constr. Co., G. A. Broden, pres., 22800 Lakeland Ave., 1 story, 60x180 ft., brick, steel factory and crane (15 ton) runway. $50,000. E. G. Hoefler, 5005 Euclid Ave., engr.

Pa., Altoona—PLANT—Linde Air Products Co., W. F. Barrett, chn. Bd., 30 East 42 St., New York, N. Y., soon lets contract 1 story, brick, steel oxygen manufacturing plant, 10 and 11 St. N.W. $40,000. S. R. Donnellon, 205 E. 42 St., New York, ch. engr.

Pa., Corry—PLANT—Aero Supply Mfg. Co., Inc., plans by Meyers & Johnson, Commerce Bldg., Erie, 1 story, brick, steel, concrete top addn. to plant. $40,000.

Pa., Dubois—PLANT—DuBois Dairy Co., J. Kriner, secy.-treas. in charge, Deposit Natl. Bank Bldg., DuBoise, sketches by R. G. Howard, 340 Deposit Natl. Bank Bldg., 1 story, bsmnt, ice cream manufacturing plant, dairy store, Reynoldsville Rd. $40,000.

Pa., Pittsburgh — MANUFACTURING — American Spiral Spring & Mfg. Co., Mr. Brian, vice pres., 56 and Butler Sts., 1 story, 50x177 ft., brick, steel, manufacturing building. $40,000.

Pa., Plymouth — FACTORY — Owner, c/o H. G. Davis, 56 Gaylord Ave., 1 story factory. $40,000.

Tex., Athens—PLANT—Harbinson-Walker Co., Athens, brick manufacturing plant. $75,000.

Tex., Houston—WAREHOUSE—Ike Freed, c/o Ben Cohen, West Bldg., bids soon, increasing present 2 story brick, concrete, stone warehouse to 3 story. $50,000. I. Klein, West Bldg., archt.

Tex., Houston—PLANT—Owen Tool Co., Pasadena, 1 story, brick, steel, concrete manufacturing plant. $46,000.

Tex., Houston—WAREHOUSE—C. B. Ehman, 1906 Commonwealth St., plans by Nunn-McGinty, 2017 W. Gray St., 1 story, 44x175 ft. brick, concrete warehouse. $50,000.

Washington—PLANT—Todd-California Shipbuilding Corp., Harbor Island, Seattle, 12,000 ton magnesium plant, Bonneville-Grand Coulee region. Over $40,000.

Wis., Mt. Pleasant — WAREHOUSE — J. I. Case Co., 700 State St., Racine, soon lets contract, 1 story, part bsmnt., 241x447 ft. and 51x136 ft. warehouse addns. F. J. Hoffman, 201 6 St., Racine, archt.

Wis., Waupun—PLANT—National Rivet & Mid State Mfg. Co., Waupun, plans by R. A. Sutherland, 259 E. Wells St., Milwaukee, 1 story, 54x121 ft., 52x54 ft. and 35x118 ft., brick, steel, concrete factory.

★**Wyo., Cheyenne**—RAILROAD SHOPS—Union Pacific R. R. Co., B. H. Prater, ch. engr., 1416 Dodge St., Omaha, Neb., rebuilding railroad shops recently destroyed by fire. $500,000.

Ont., London—GARAGE—Bell Telephone Co. of Canada Ltd., 1050 Beaver Hall Hill, Montreal, Que., soon lets contract, 1 story, 50x130 ft. garage exten., Pall Mall St. About $50,000.

Que., Longue Pointe—PLANT—Canadian Propellers Ltd., 420 Dominion Square Bldg., Montreal, soon lets contract, superstructure plant. $150,000.

Que., Montreal—WAREHOUSE, etc.—Stemberg's Groceterias, Ltd., 1430 Overdale Ave., soon lets contract, 1 story, 250x500 ft. warehouse with small 2nd story, 60x250 ft., for office, frame brick, rein.-con. fdn., rear of Canadian Pacific Ry., Park Ave. station. Est. about $400,000. I. S. Paul St., W., engr.

BIDS ASKED

Bids Asked July 21

R. I., Providence—FACTORY—Armour & Co., Union Stock Yards, Chicago, Ill., 1 story, bsmnt., 130x240 ft. sausage factory and meat house. $200,000. F. A. Lindberg, Armour Co., Union Stock Yards, Chicago, Ill., archt. Jenks & Ballou, 2600 Industrial Tr. Bldg., engrs.

Bids Asked July 22

N. J., Rahway—LABORATORY—Merck & Co., 126 E. Lincoln Rd., 2 story loft exten. to Laboratory Building 50-D. Over $40,000. Ballinger Co., 105 S. 12 St., Phila., Pa., archt.

Bids Asked July 25

N. Y., Brooklyn—MILL, etc.—Robins Dry Dock & Repair Co., Erie Basin, 1 and 3 story, 150x500 ft. mill and factory, Beard St. $416,700. Albert Kahn & Assoc., 345 New Center Bldg., Detroit, Mich., archts.

Bids Asked about August 1

★**Ill., Aurora**—PLANT—Western United Gas & Electric Co., Aurora, power plant addn. and alterations. $500,000. Sargent & Lundy, Inc., 140 S. Dearborn St., Chicago, engrs.

Bids Asked

Calif., Los Angeles—PLANT—Zellerbach Paper Co., 3000 E. 12 St., warehouse addn., 3000 E. 12 St. $42,000. Austin Co., 797 E. Washington Blvd., archt. CD 7/14.

Ill., Chicago—CHEMICAL PLANT—Phillip A. Hunt Co., 1076 W. Division St., 1 and 2 story chemical plant, 2100 Fullerton Ave. $50,000.

Ia., Charles City—SWITCH BUILDING—Iowa Pub. Serv. Co., W. N. Porter, secy., 517 Fifth Ave., steel, concrete switch building, switch gear and wiring. $90,000. CD 7/8—ENR 7/10.

N. J., Union — INDUSTRIAL — Owner, c/o V. H. Strombach, archt., 243 Springfield Ave., Irvington, 1 story, 175x322 ft. brick, steel, limestone industrial building.

Pa., Albion—PLANT—Rogers Bros. Corp., 1 story, brick, steel, concrete plant addn. $50,000 or more. CD 6/20—ENR 7/3.

LOW BIDDERS

Que., Montreal — GARAGE — Provincial Transport Co., Ltd., 1188 Dorchester St. W., garage, from A. F. Byers & Co., Ltd., 1226 University St. Est. about **$200,000.** CD 3/5—ENR 3/20.

CONTRACTS AWARDED

Calif., Berkeley—PLANT—American Forge Co., 750 Potter St., plant addn., day labor. **$50,000.**

INDUSTRIAL BLDGS. (Contracts Awarded, Cont'd)

Calif., Delano — PLANT — Perelli-Minetti & Sons Winery, Delano, rein.-con. plant addns., to Cahill Bros., 206 Sansome St., San Francisco. **$100,000.**

★ **Calif., North Hollywood**—PLANT—Bendix Aviation Ltd., Union Air Terminal, Burbank, 2 story, 240x350 ft., factory, 2 story, 46x170 ft. office, 2 story, 28x350 factory office building, steel, concrete, 11,600 Sherman Way, to Austin Co., 777 E. Washington Blvd., Los Angeles. Approx. **$500,000.** H. L. Gogerty, 1717 N. Vine St., Hollywood, archt.

Calif., Oakland—SHOPS—Cochran & Celli, 1100 8 Ave., 1 story, brick shop addn., to C. H. Thrams, 28 Home Pl. W. **$45,750.**

Calif., San Francisco—FACTORY—N. G. Hecker, 335 1 St., 1 story, rein.-con. factory, to Austin Co., 1001 Ray Bldg., Oakland, **$55,000.** A. K. Cowell, Ray Bldg., Oakland, engr.

Calif., South San Francisco—TANNERY—Poetsch & Peterson, 3100 Army St., San Francisco, 1 story, 100x450 ft., brick, wood frame tannery, to H. H. Larsen Co., 64 South Park, San Francisco. **$200,000.** CD 5/14—ENR 5/29.

Calif., Vernon—WAREHOUSE—Glass Containers, 3601 Santa Fe Ave., 168x301 ft. warehouse, to Mac Issac & Menke, 3445 Union Pacific Ave., Los Angeles, approx. **$68,000.** Leland S. Rosener, 233 Sansome St., San Francisco, engrs.

Conn., Bridgeport — FACTORY — General Electric Co., Boston Ave. and Bond St., 2 story, 40x66 ft., brick, steel, factory addn., also 20x464 ft. steel, concrete platform, to Gellatly Constr. Co., 25 Housatonic Ave. Est. **$40,000.**

Conn., Hamden — WAREHOUSE, etc. — P. Ballantine & Sons, 975 Dixwell Ave., New Haven, brick, steel warehouse, garage and offices, Dixwell Ave., to Wadhams, May & Carey Co., 15 Lewis St., Hartford. Est. **$50,000.** CD 6/27—ENR 7/3.

Conn., New Haven — PLANT — New Haven Quilt & Pad Co., 84 Franklin St., 3 story, 50x75 ft., brick, steel plant addn., to Mott-Mohr Constr. Co., Inc., 440 Elm St., **$50,000.** J. Weinstein, 100 Lowin Ave., archt. CD 4/10—ENR 4/17.

Conn., West Haven — TRUCK SALES and SERVICE GARAGE—Mack Motor Truck Co., lessee, 151 Orange Ave., 1 story, 100x200 ft., brick, steel, concrete truck sales and service garage, Orange Ave., to Fusco-Amatruda Co., 50 Amity St., New Haven. Est. **$60,000.** L. F. Caproni, 1221 Chapel St., New Haven, engr.

Ill., Chicago—PLANT—American Brake Shoe & Fdry Co., Mahwah, N. J., plant addn., 4516 W. 26 St., to C. B. Johnson & Co., 6 N. Michigan Ave. Est. about **$100,000.**

Ill., Chicago—FACTORY—American Flange Mfg. Co., 825 S. Kirkpatrick Ave., 3 story, 75x290 ft. factory addn., to Elmo Ward, 4720 W. Arthington St. Est. **$200,000.** W. S. Crosby, 6. N. Michigan Ave., archt.

Ill., Chicago — PLANT — American Varnish Co., 1140 N. Branch St., 3 story plant addn., to Rune & Son, 6760 Stony Island Ave. Est. **$50,000.** Engineering Systems, Inc., 221 N. LaSalle St., archt.

Ill., Chicago—PLANT—Oscar Mayer & Co., 1241 N. Sedgwick Ave., 2 story top addn. to meat packing plant, to Sill Constr. Co., 520 N. Michigan Ave. Est. **$50,000.** Henschien, Everds & Crombie, 59 E. Van Buren St., archts.

Ill., Chicago—FACTORY—Midland Machine Corp., 6499 W. 65 St., 1 and 2 story factory, 35 St. and Parnell Ave., to Whipple Co., 400 W. Madison St. Est. **$100,000** incl. equip.

Ill., Chicago—FACTORY—C. E. Nichoff & Co., 4925 Lawrence Ave., 1 story factory, to J. Emil Anderson, 3659 W. Belle Plaine Ave. Est. **$40,000.** E. M. Sieja, 4137 W. Barry Ave., archt.

★ **Ill., Chicago**—GARAGE—Railway Express Co., 612 S. Clinton St., 1 story, 300x625 ft. garage, 18 and Prairie Ave., to Enjay Constr. Co., 160 N. LaSalle St. Est. **$500,000.**

★ **Ill., Chicago**—PLANT, etc.—Shaw, Naess & Murphy, archts., 80 E. Jackson Blvd., 2 story, 280x320 ft. bottling plant and garage, Polk St., for Coca Cola Bottling Co., 7 E. 73 St., to Paschen Bros. Constr. Co., 221 N. La Salle St. Est. **$500,000.** CD 6/3—ENR 6/12.

★ **Ind., Indianapolis** — PLANT — Indianapolis Power & Light Co., 17 N. Meridian St., turbine, Harding St. plant, to General Electric Co., 1 River Rd., Schenectady, N. Y. About **$1,800,000.**

Ia., Cedar Rapids—PLANT—Pepsi Cola Co., Will Tehil, pres., 1301 3 St. S.W., Cedar Rapids, 1 story, part bsmnt., 76x88 ft., brick, concrete soft drink bottling plant, to J. G. Miller Constr. Co., 222 West Mullen Ave., Waterloo. Est. **$40,000** with equip.

Ia., Dubuque—BOILER HOUSE—Interstate Power Co., Dubuque, substructure boiler house, to E. L. Archibald Co., 11 S. LaSalle St., Chicago, Ill. Est. **$40,000.** CD 2/18—ENR 2/20.

Ia., Malcom—GRAIN ELEVATOR—Farmers Elevator Co., H. Booknau, mgr., remodeling, enlarging grain elevator, to T. E. Ibberson Co., 300 Corn Exch. Bldg., Minneapolis, Minn. Est. **$40,000.**

Md., Baltimore—WAREHOUSE—American Stores Co., 2201 Mosher St., 1 story, 145x230 ft., brick, steel warehouse, concrete fdns., to Consolidated Eng. Co., 20 E. Franklin St., **$75,000.**

Md., Baltimore—WAREHOUSE—Southern States Co-operative, 2101 E. Fort Ave., 1 story 120x160 ft. warehouse addn., to Baltimore Contractors, 23 N. Central Ave. **$48,000.** CD 7/2.

Mass., Attleboro — FACTORY — American Metal Crafts Co., Inc., 49 South Main St., 1 story, 53x270 ft., brick, steel factory, S. Main St., to Clive Akerley, 18 Thatcher St. **$53,000.**

Mass., Jamaica Plain—FACTORY—Kinney Mfg. Co., 3541 Washington St., 1 story 55x232 ft. factory addn., Washington St., to Richard White Sons, Inc., 67 Cherry Pl., Newton. Est. **$40,000.** M. A. Reidy, 44 School St., Boston, engr.

Mass., Worcester — SHOP — Leland-Gifford Co., 1001 Southbridge St., 3 story, 100x105 ft., timber, steel machine shop addn., Southbridge St., to A. J. Daniels, 661 Main St., Shrewsbury, **$51,700.**

Mass., Worcester — GARAGE — Worcester Street Railway Co., 107 Main St., 1 story, 105x145 ft., brick, steel bus garage addn. Park Ave. Owner builds. **$40,000.**

Mich., Lansing — PLANT — Olds Motor Works, Lansing, sheet metal plant addn., to Christman Co., 408 Kalamazoo Plaza, Lansing, **$250,000.**

Mo., Farmington—FACTORY—Farmington Chamber of Commerce 1 story, 129x301 ft. brick, steel, concrete shoe factory, to A. H. Jennings, Farmington. Est. **$75,000.** F. L. Thompson, 441 Clark Ave., Kirkwood, (St. Louis P. O.) archt.

Mo., Kansas City—PLANT—Black, Sivals & Bryson, 7500 E. 10 St., 1 story, brick, steel manufacturing plant addn., to Rau Constr. Co., 2409 Harrison St. Over **$40,000.**

Mo., Poplar Bluff—BOOSTER STATION—Mississippi River Fuel Corp., 407 N. 8 St., St. Louis, steel frame, corrugated siding, booster station for gas pipe line. Owner builds. **$150,000** with equip.

Mo., St. Louis—FACTORY—Barrett Equipment Co., 2101 Cass Ave., 1 story, 47x130 ft., brick, concrete factory addn., 2103 Cass Ave., to Murch-Jarvis Co., Cotton Bldg., 408 Pine St. Est. **$40,000** with equip. H. Van Hoefen, 408 Pine St., archt.

Mo., St. Louis—FACTORY—Crown Cork & Seal Co., 5620 Natural Bridge Ave., 52x200 ft. factory addn., to A. Monschein, 1898 Arcade Bldg., St. Louis. Est. **$40,000** with equip.

Mo., St. Louis — PUBLISHING PLANT — Pulitzer Publishing Co., J. Pulitzer, pres., 12 Blvd. and Olive St., 3 story, bsmnt., subbsmnt., 106x206 ft., rein.-con., brick, steel newspaper publishing plant addn., to Westlake Constr. Co., 1919 Railway Exch. Bldg., fee basis. Est. **$450,000.** CD 4/11—ENR 4/17.

Mo., St. Louis—PLANT—St. Louis Car Co., 8000 N. Bway., St. Louis, 1 story, 162x232 ft., 1 story, 240x300 ft., and 1 story, 80x232 ft., brick, steel, plant buildings, concrete fdns. 600 Bitttner St., own forces and sub-contracts. **$100,000.**

N. J., Garfield—STORAGE—Heyden Chemical Corp., 290 River Rd., 3 story, bsmnt., 48x50 ft. brick, steel storage bldg., River Rd., to J. H. Steele & Sons, Inc., 48 N. 2 St., Paterson. **$40,000.** A. Haenicken, 349 9 Ave., Paterson, archt.

N. Y., Brooklyn—BOILER HOUSE, etc.—Robins Dry Dock & Repair Co., Erie Basin, boiler house and unit, to C. J. Moore, Inc., 285 Madison Ave., New York. **$150,000.** CD 6/16—ENR 6/19. Under Public Buildings.

O., Akron—POWER HOUSE—Goodyear Tire & Rubber Co., 1144 E. Market St., Akron, 1 story brick, steel, power house and transformer building, to Hunkin Conkey Constr. Co., 1740 E. 12 St., Cleveland. Est. **$90,000.** J. G. Turnbull, 850 Euclid Ave., Cleveland, engr. Awarded 7/1.

O., Bellefontaine—ENGINE HOUSING—New York, Chicago & St. Louis R. R. Co., A. C. Harvey, ch. engr., Terminal Tower, Cleveland, engine house, to Walsh Constr. Co., 19 S. LaSalle St., Chicago. Est. **$100,000.**

O., Cleveland—BAKERY—Great Atlantic & Pacific Tea Co., 3450 Croton Ave., 4 story, 28x105 ft. brick, rein.-con. bakery addn., to J. E. Christian Co., 5606 Curtiss Ave. Est. **$40,000.** Awarded 7/1—CD 4/16—ENR 5/1.

O., Cleveland—BAKERY—Hall Baking Co., R. H. Mersbach, mgr., 2001 Walton St., 1 story, 61x163 ft., brick, steel bakery addn., to Paugh & Brown, Inc., 6007 Euclid Ave. Est. **$40,000.** Mills, Rheines, Bellman & Nordoff, 518 Jefferson Ave., Toledo, archts. Awarded 7/2.

O., Cleveland—FACTORY and WAREHOUSE—Ohio Rubber Co., c/o A. Smith, Ben Hur Ave., Willoughby, 1 story, 90x240 ft., brick, steel factory and warehouse, to Gordon Rutland, Los Nation Rd., Willoughby. Est. **$40,000.** Awarded 7/1.

O., Cleveland — FACTORY — Chandler Products Co., R. C. Chandler, pres., 1491 Chardon Rd., 1 story, 58x140 ft. brick, steel, factory addn., to Sam W. Emerson Co., 1836 Euclid Ave. Est. **$45,000.** Awarded 7/8. E. McGeorge, 9400 Quincy Ave., engr.

O., Cleveland — RECEIVING, etc. — Parker Appliance Co., A. L. Parker, pres., 17325 Euclid Ave., design and construction 1 story, 100x300 ft., brick, steel receiving and shipping building to Austin Co., 16112 Euclid Ave. Est. **$50,000.**

O., Garfield Heights—FACTORY—Cleveland Chain & Mfg. Co., R. L. Rossi, pres., 1 story, 40x80 ft. and 40x60 ft., factory addns., to E. J. Benes & Co., Terminal Tower, Cleveland. Est. **$40,000.** E. G. Hoefler, 5603 Euclid Ave., Cleveland, engr. Awarded 7/9.

Ore., Portland—PLANT—[illegible] H. & R. A. Rawlinson Co., 1221 N. E. Couch St., 1 story, 79x148 ft., dry-cleaning plant and office, to G. L. Hord, Couch Bldg. Est. over **$40,000.** Roald & Schneider, Spalding Bldg., archts. Awarded 7/3.

Pa., Clearfield—FACTORY—Harbison Walker Refractories Co., A. M. Munro, dist. plant mgr., E. 2 St., 1 story, 250x800 ft., brick, steel, concrete brick factory, separate contracts. D. B. Hendry, Farmers Bank Bldg., Pittsburgh, engr.

Pa., Creighton—PLANT—Pittsburgh Plate Glass Co., J. A. Bechtel, purch. agt., Grant Bldg., Pittsburgh, 4 story, 56x228 ft., brick, steel, concrete safety glass manufacturing building, side addn., to Groomes Constr. Co., Box 133, Springdale. Est. **$100,000.** R. D. Bole, Grant Bldg., Pittsburgh, company's engr. CD 5/21—ENR 5/29, under CA.

Pa., Erie —POWER PLANT — Erie County Electric Co., D. W. Jardine, pres. and mgr., 12 and French Sts., brick, steel, concrete power plant addn. imprvs., 5 and Cranberry Sts. to United Engineers & Constructors, Inc., 2401 Arch St., Phila. Est. over **$40,000.** CD 7/2—ENR 7/10.

Pa., Phila.—PROCESSING—Publicker Commercial Alcohol Co., 1800 W. Lehigh Ave., processing building, to S. H. Levin, 1633 Sansom St. Est. over **$40,000** with equip.

Pa., Plymouth — PLANT — Owner, c/o Wyoming Valley Industrial Com., Wilkes-Barre, 1 story, textile products plant, site of old West Stocking Jill, separate contracts. Est. **$40,000.** CD 7/1—ENR 7/10.

Tex., Edinburg—PLANT—McBride Roofing Co., c/o L. McBride, Edcouch, distillate roofing plant, to Wadoline Corp., Continental Bldg., Dallas. **$40,000.** J. P. James, c/o owner, engr.

Tex., Houston — WAREHOUSE — Southern Floral Co., 1310 Calhoun Rd., 1 story, brick, concrete warehouse, with refrigeration vault, to Forest McNeir Co., 2306 Chartress St. **$40,000.**

Tex., Houston — WAREHOUSE — Mrs. L. Berlowitz, 2321 Southmore St., 1 story, 42x100 ft. brick, concrete warehouse with 2 wings, to F. J. Niven, 1801 Crawford St. Est. **$40,000.** I. D. Kline, West Bldg., archt.

Tex., Houston—WAREHOUSE—Planters Oil Co., 3600 Clinton Dr., 1 story, brick, concrete, masonry warehouse. Owner builds. **$40,000.**

Va., Fieldale—PLANT—Marshall Field & Co., 220 W. North Bank St., Chicago, Ill., manufacturing plant addn., to John Smith & Sons, Leaksville, N. C. **$69,000.** Robert & Co., Inc. Bona Allen Bldg., Atlanta, Ga., archts.

Va., Front Royal — PLANT — Old Virginia Packing Co., Front Royal, packing plant, to F. B. Fuqua & Son, Lynchburg, approx. **$100,000.** CD 2/4—ENR 2/6.

Wash., Seattle—MILL—Continental Bakery Co., 434 Aurora Ave., 116x164 ft. mill addn., to Daniels & Turnquist, Orpheum Bldg., Seattle. Est. **$200,000.** W. B. Aitken, Court Bldg. archt.

Wis., Algoma—FACTORY—Algoma Plywood and Veneer Co., Algoma, general contract, 1 story, 124x240 ft. and 1 story, 124x140 ft. factory buildings, to Thomsen-Abbott Constr. Co, 201½ S. Central Ave., Marshfield ***steel, to Wausau Iron Wks., Wausau. CD 6/5—ENR 6/12.

Wis., Green Bay — FACTORY — Menominee Sugar Co., R. 7, general contract 3 story, 21x68 ft. factory and 2 story, 19x37 ft. office building, to E. H. Regal Constr. Co., 156 S. Adams St. Foeller, Schober, Berners, Safford & Jahn, 310 Pine St., archts.

Wis., Green Bay—GARAGE—J. Rosenberg, Green Bay, general contract, 1 story, 74x140 ft. addn. and remodeling garage, to Selmer Co., Northern Bldg., Green Bay***structural steel, to Northeastern Boiler and Welding Co., Green Bay***plumbing, heating, to Tweet Bros., Green Bay. CD 3/18—ENR 3/20

Wis., Ladysmith—CREAMERY—Ladysmith Milk Producers Co-operative Assn., general contract creamery addn., to J. Kratochvil, New Prague, Minn. Total over **$40,000.** CD 6/24—ENR 6/26.

Ont., Galt—PLANT—Canada Mchy. Corp. Ltd., Galt, 1 story, 121x140 ft., steel plant, concrete fdn., to G. H. Thomas & Son Ltd., 45 Dickson St. About **$140,000.**

Ont., Owen Sound—PLANT—Wm. Kennedy & Sons, Ltd., 1114 First Ave. W., 1 story, 63x143 ft. steel, concrete plant, concrete fdn., to Woolwich & Clark, 1099 First Ave. Est. **$45,000.** Ewart, Armer & Byam, Excelsior Life Bldg., Toronto, engrs.

Ont., Sault Ste. Marie — PLANT — Algoma Steel Corp., 503 Queen St. E., metal clad structure, 3 buildings, 56x209 ft. engine room and roll shop, 43x84 ft. generator room, 28x100 ft. billet mill, to McLarty & Hannah, 123 Spring St.

Ont., Windsor—PLANT — Sterling Products Ltd., 1019 Elliott St. W., plant addn., to T. H. Startup, 3039 Alexander Blvd. **$50,000.**

Que., Montreal—ENGINE HOUSE—Canadian National Rys., 360 McGill St., H. A. Dixon, ch. engr., exten. 11 existing stalls of engine house, time office, arch brick and casting shop, etc. Turcot Yards, to W. W. Steward, 1446 St. Catherine St. W. about **$150,000.** Bids 6/25. CD 6/10—ENR 6/12.

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